JPRS 78467

8 July 1981

USSR Report

LIFE SCIENCES

AGROTECHNOLOGY AND FOOD RESOURCES

No. 13

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JPRS 78467

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CONTENTS

UDC: 63.001

HEADING TOWARD INTENSIFICATION AND EFFICIENCY

Moscow VESTNIK SEL'SKOKHOZYAYSTVENNOY NAUKI in Russian No 3, Mar 81 pp 1-6

[Article by P. P. Vavilov, academician of VASKhNIL (All-Union Academy of Agricultural Sciences imeni Lenin), president of the All-Union "Order of Lenin" and "Order of the Red Banner of Labor" Academy of Agricultural Sciences imeni V. I. Lenin]

[Text] In the draft of the CC CPSU for the 26th Party Congress, "Main Directions of Economic and Social Development of the USSR in 1981-1985 and up to 1990," it is stated that it is imperative to increase the effectiveness of scientific research, significantly reduce the time of introduction into industry of the advances of science and technology. As indicated in this Party document, under the 11th Five-Year Plan the development of science and technology must be governed to an even greater extent by the solutions to the most important problems of continued progress of Soviet society, faster change of the nation's entire economy, including agriculture, to the route of intensive development.

The All-Union Agronomic Conference was convened in Moscow in late December 1980. The issues discussed there go far beyond the framework of professional agronomic problems. They reflect the bases of the Party's agrarian policy and its main strategic goal, that of assuring the consistent improvement of well-being of the Soviet people. At this impressive forum there was basic discussion of how to make better, more intensive and efficient practical use of the vast economic and scientific-technological potential that has been accumulated and, first of all, how to use the land, which is the main resource of agriculture, with maximum return, being routinely concerned with augmenting its fertility.

Agronomist-technologists and production organizers constitute the most representative and largest detachment of agricultural specialists, and they number about 1,800,000 people. There are many genuine enthusiasts of scientific and technological progress in rural areas among them.

In his exceptionally warm and meaningful greeting, addressed to the conference participants by comrade L. I. Brezhnev, general secretary of the CC CPSU and chairman of the presidium of the USSR Supreme Soviet, he stated: "The Party considers specialists to be a reliable support for implementing its agrarian policy. The Soviet people have entrusted to agronomists the concern about the land, the main resource of agriculture, the most important source of national wealth. And the agronomist does not have a more important cause than to preserve and make careful

use of each hectare of plowed land, meadows, pastures, and to enhance their fertile strength.... It is a matter of honor for each agronomist to bear with dignity the honorary title of legislator of the fields, to be a right-flank man in the struggle for sophistication, increased productivity and stability of agriculture."

Among the speakers at the All-Union Agronomic Conference, there were agronomists from kolkhozes, sovkhozes, rayons, farm managers, secretaries of obkoms and kraykoms of the Party, ministers and scientists. The speech of comrade M. S. Gorbachev, member of the Politburo of the CC CPSU and secretary of the CC CPSU, the report of comrade V. K. Mesyats, USSR minister of agriculture and statements made by other participants reflected virtually all basic problems of economic and social development of modern rural areas, with in-depth analysis of the state of affairs, summarization of positive experience, disclosure of flaws, formulation of the main tasks for development of industry and agricultural science in the near future, for improving the efficiency and stability of agriculture.

A new, large step forward was made in the development of agriculture as a result of implementation of the Party's agrarian policy, which was formulated by the March (1965) plenum of the CC CPSU and subsequent Party decisions. For the first time in the history of our country, the mean annual gross grain harvest reached 205 million tons during the period of the 10th Five-Year Plan. In the last year of the 10th Five-Year Plan, the farmers of Kazakhstan made a major contribution to the nation's grain resources, having sold the government 16.4 million tons of grain, overfulfilling their socialist commitments. The kolkhozes and sovkhozes of Stavropol'skiy Kray, Novosibirskaya, Voroshilovgradskaya, Dnepropetrovskaya, Khar'kovskaya and other oblasts made great achievements. A considerable amount of grain was sold by farms in Volgogradskaya Oblast, Bashkirskaya ASSR, Altayskiy and Krasnodarskiy krays, Rostovskaya, Kurganskaya, Orenburgskaya and Omskaya oblasts. The rice growers of Krasnodarskiy Kray achieved a great victory, having raised more than 1 million tons of rice, the ones in Kzyl-Ordinskaya Oblast produced 458,000 tons and in Karakalpakskaya ASSR 294,000 tons. The largest harvest of raw cotton in the entire history of our country, 9.96 million tons, was obtained, and the plan for sale thereof to the government was overfulfilled by all cotton-growing republics. Considerably more agricultural and livestock products are being produced in our country. The level of consumption per capita is growing. However, there are still difficulties in providing cities and industrial centers with such food items as meat and milk.

The draft of the CC CPSU for the 26th Party Congress defines the main directions of economic and social development of the USSR in 1981-1985 and the period up to 1990. The CC CPSU and USSR Council of Ministers have made some very important decisions: "On Improvement of Planning and Economic Stimulation [Incentives for] of Production and Procurement of Agricultural Products" and "Additional Measures to Increase Agricultural Production in Citizens' Privately Owned Subsidiary Farms."

In the plans for economic and social development of the USSR approved by the Party, first and foremost attention was and is given to continued, constant improvement of public well-being, and first of all improvement of supply of foodstuffs for the people.

At the October (1980) plenum of the CC CPSU, comrade L. I. Brezhnev advanced the task of preparing a food program, called upon to unify problems of development of agricultural and industrial sectors that service it, procurement, storage, transportation and processing of agricultural products, problems of development of the food industry and food trade. On this basis, a single agroindustrial complex is being formed in the nation, the main nucleus of which is agriculture.

In our times, agriculture is no longer an entity onto itself; it is related to other sectors of the national economy through close technological, economic, organizational, legal and other ties. At present, 85% of the fixed assets (not counting land) in agriculture are of industrial origin, and more than half its products pass to the food, light and other sectors of industry for processing.

In the draft of the CC CPSU for the 26th Party Congress, new and lofty frontiers have been outlined for development of the agroindustrial complex, the main objective of which is to reliably supply the nation with food and agricultural raw material. To succeed in implementing the food program, it intends to provide standardized planning, proportionate and balanced development of sectors of the agroindustrial complex, significant strengthening of its material and technical base, improvement of economic ties between sectors, organization of effective interaction thereof to build up agricultural production, improve its preservation, transportation, processing and delivery to the consumer.

As stipulated in the draft of the CC CPSU for the 26th Congress, under the years of the 11th Five-Year Plan we will have to raise mean annual grain production to 238-243 million tons, raw cotton to 9.2-9.3 million tons, sugar beets to 100-103 million tons, increase production and assortment, as well as improve the quality, of potatoes, vegetables, fruit, berries grapes, tea and other crops. In the livestock farming area, it is planned to raise annual mean meat production to 17-17.5 million tons (dressed weight), milk to 97-99 million tons, eggs to 72 billion units and wool to 470,000-480,000 tons.

Under the 11th and 12th 5-year plans, the economic and social programs are directed toward proportionate and balanced development of all areas and sectors of the agroindustrial complex. This means that there will be substantial reduction of existing disproportion, both between different sectors of the agroindustrial complex and within agriculture. Implementation of tasks pertaining to essential completion of the transfer of agricultural production to an industrial footing and progressive technology is of enormous economic and social significance. This will be aided by the measures outlined by the Party for continued development of tractor and farm machine building, increased production of machinery and equipment for livestock farming and feed production, enlargement of area of reclaimed land, increased delivery of fertilizers and other chemicals for agriculture and the livestock industry.

Under the 11th Five-Year Plan, growth of agricultural production and development of the entire agroindustrial complex will take place on the basis of intensification and scientific technological progress. In this regard, the role of agricultural science will grow significantly, as it is called upon to work on large-scale scientific-technological problems, implement accelerated introduction of scientific achievements into the industry, thereby aiding in its intensive and effective development. This was discussed clearly and convincingly at the All-Union Agronomic Conference, especially in the speech of comrade M. S. Gorbachev, member of the Politburo of the CC CPSU and secretary of the CC CPSU.

What does intensive and effective management of agriculture mean? It means that wise use must be made of each hectare of land, with maximum production obtained

from it with concurrent systematic and consistent increase in soil fertility. This is specifically achieved by developing and putting in operation an optimum system of agriculture with all its main elements, including crop rotation, protection of soil against erosion, methods of treating soil, varieties, seed growing and fertilizer standards.

Agriculture cannot tolerate lack of originality. It bears the imprint not only of zonal distinctions, but even of very local soil and climate conditions. While a system of agriculture based on crop rotation with clear fallow, soil-protection technology and other elements is the most effective for the dry steppe regions of Northern Kazakhstan and West Siberia, for the Nonchernozem zone of RSFSR, in particular Pskovskaya Oblast, as noted at the All-Union Agronomic Conference, the best results are obtained with a system of agriculture that includes perennial grass, use of organic and mineral fertilizers, liming of acid soil.

At the present stage of development of agriculture, systems are needed that are based on meticulous choice of cultivars, profound and comprehensive consideration of soil fertility, mechanical composition of soil, structure of crop rotation, distribution of pests, diseases and weeds. Over the enormous expanses of our country with the diversity of its environmental conditions, which are often unfavorable for agriculture, there are both steppe and forest-steppe regions that require soil-protection measures, as well as mountain zones, where it is imperative to protect soil against water and wind erosion. There, special agricultural systems are required. On reclaimed land, the area of which is now up to 35 million ha [hectares], it is imperative to practice only highly intensive agriculture, since enormous material and technical resources have been invested in it. In irrigated areas, it is particularly important to make efficient use, not only of every hectare of land, but each cubic meter of water, each quintal of chemical fertilizers, and to obtain the maximum harvests. The technology, cultivars and crop rotations there must be other than for nonirrigated land. In essence, reclamation agriculture must be created.

To manage agriculture intensively and efficiently in all zones means that there must be wise use of each kg of fertilizers, each hour of work time, each liter of fuel, each ruble of allocated funds, each ton of building and other materials, with maximum return.

Agriculture is regional, zonal, in nature. An optimum system of managing agriculture as a whole, and cultivation as its basic element must thus be developed by scientific institutions for each oblast, each kray, region, farm, and it should be introduced with the active involvement of scientists.

In the light of the targets spelled out in the draft of the CC CPSU for the 26th Party Congress with regard to development of agriculture as an organic element of the agroindustrial complex, increasingly important problems are confronting the regional departments of VASKhNIL. The main purpose of creating regional departments of the academy is to bring science as close as possible to the production aspect of agriculture. The main idea can be reduced to the fact that there is a strong, sturdy and solid science within agricultural production. Such staffs have been provided. A task of paramount importance for the regional departments is to concentrate the efforts of institutes under their jurisdiction on working together [in a complex manner] on the key problems, as well as consistent and extensive introduction of results of research into production.

Validation and development of complex measures for development of farming, with due consideration of its modern requirements, constitute a most important task for zonal scientific research institutes. The new situation requires basically new approaches to research, methodology and effectiveness thereof. The main thing now is to be able to offer an optimum program for wise use of land, to arm it with specialists and farm managers, and to see that it is implemented. It is important to deploy such work, as broadly as possible, in local areas, and to prepare systems for farm management and systems of agriculture within the shortest possible time.

One of the decisive factors in systems of agriculture is optimum use of organic, mineral fertilizers and other procedures that aid in constantly increasing soil fertility. The scientists at the All-Union Scientific Research Institute of Fertilizers and Agrosoil Management and other scientific research institutions concerned with this problem play a particularly important role in achieving this goal. They are called upon to expedite development and refinement of scientifically validated proposals for optimum use of organic and mineral fertilizers. In turn, agrochemical specialists must develop, on the basis of agrochemical maps, the most suitable doses and methods of using fertilizers at each farm, in each field, for each crop and cultivar;they must determine the most effective proportion of nutrients. Farms, particularly in regions with adequate water or irrigated land, must obtain the maximum return on the basis of introduction of scientific recommendations.

It is quite important on farms to make the most effective use of herbicides and methods of protecting crops from pests, diseases and weeds, as well as to use biological methods of control thereof.

Accelerated development and introduction of new, highly productive cultivars and use of highly effective industrial technology for cultivation of agricultural crops, particularly corn, sunflowers, sugar beets, soybeans, long-stemmed flax, potatoes and vegetables are an important factor in scientific-technological progress in grain farming and other sectors of plant growing.

The development of breeding centers for plant growing constituted a qualitatively new stage in breeding. There are already 50 breeding centers for grain, feed, commercial, vegetable, fruit and berry crops and potatoes in the main natural zones of our country. Under the years of the 10th Five-Year Plan, these institutions made a perceptible contribution to development of breeding theory and methods, problems of resistance to frost and winters, drought resistance, grain quality, immunity and introduction. The universal collection of cultivars and related wild species of the All-Union Scientific Research Institute of Plant Growing imeni N. I. Vavilov, which serves as the basis for developing new cultivars, has been enriched in the last few years with over 60,000 new specimens, and presently numbers 300,000.

The wide deployment of activity of breeding centers, reinforcement thereof with highly qualified scientific personnel, material and technical supplies, intensive involvement of the universal gene resources in breeding programs have improved significantly the quality and efficacy of breeding work on new and highly productive cultivars. The breeding centers apply the principle of complexity in developing new varieties; they have created hothouses, phytotrons and other facilities that produce 2-3 generations of plants per year. This has speeded up the breeding

process by 1.5-2 times, expanded the volume of work and, ultimately, increased the number of cultivars submitted for State testing. Thus, while the experimental breeding institutions developed and submitted 1466 varieties for State testing under the 9th Five-Year Plan, there were 1737 new field cultivars in 1976-1980. Under the 10th Five-Year Plan, a total of 578 new cultivars were assigned to different rayons for the first time, versus 460 in the preceding 5 years.

Short-stemmed varieties of wheat, short-stem and polyploid cultivars of winter rye, sugar beet hybrids, unshattering pea varieties, sunflower hybrids involving the use of cytoplasmic male sterility (CMS) and wilt-resistant cotton cultivars were developed and then widely produced on the basis of new and more effective breeding methods.

The yield from many cultivars, particularly grain crops, has reached the parameters spelled out by the CC CPSU and USSR Council of Ministers in the decree "On Measures for Continued Increase in Effectiveness of Agricultural Science and Strengthening Its Ties With Industry." The new and highly productive varieties of grain crops assigned to rayons in 1971-1980 were raised over an area of 41 million ha by the end of the 10th Five-Year Plan, which yielded an additional 7-8 million tons of grain.

Winter wheat is a particularly vivid achievement of Soviet breeding. New, highly productive cultivars--Mironovskaya 25, Severodonskaya, Odesskaya semidwarf, Krasnodarskaya 39, Severokubanka, Semidwarf 49, Zarya--were developed as a result of extensive use in the breeding program of the famous cultivars Bezostaya 1 [awnless] and Mironovskaya 808, and they are now raised extensively; their genetic productivity potential constitutes 70-90 q/ha. The area where many of these cultivars are being raised is increasing quite rapidly. For example, the area used to grow Severodonskaya winter wheat, developed by the Zernograd State Breeding Station, increased from 0.63 million ha in 1979 to 1.27 million ha in 1980. The cultivars of the Mironovskiy Scientific Research Institute of Wheat Breeding and Seed Growing occupy more than one-third of the nation's winter wheat fields. The broad introduction of Mironovskiy wheat and additional harvesting of its grain yielded more than 1 billion rubles of relative ["uslovno"] net income, 225,000 rubles of which are referable to 1980. Each ruble spent on breeding yielded more than 120 rubles of net income.

In accordance with the scientific and technical target for spring wheat, the experimental breeding institutions had to develop and submit for State testing 28 varieties of spring wheat in the years of the 10th Five-Year Plan. A total of 107 cultivars were developed and delivered to the State crop-testing network. In this period, 38 new varieties were assigned to rayons for the first time, and this improved the varietal composition of spring wheat. During the term of the past 5-year plan, cultivars developed by the Scientific Research Institute of Agriculture of the South-East took up the largest areas covered with this crop--26.2-28.9 million ha, or 68-69% of varietal fields. Of the new cultivars assigned to rayons in the last 10 years, the following are grown extensively on the nation's fields: Saratovskaya 42, Novosibirskaya 67, Moskovskaya 35, Omskaya 9, Tselinnaya 20 and 21, Shadrinskaya, Karagandinskaya, Kutulukskaya. New varieties of spring wheat have been developed: Irtyshanka 10, Krasnoyarskaya and others, which are characterized by early ripening and have the quality of strong wheat varieties.

Substantial changes have taken place in the varietal composition of winter rye. The new, short-stemmed, nonlodging Chullan and Voskhod 2 cultivars merit a particularly high rating; they are capable of yielding 40-50 q/ha grain per ha under production conditions, which is 10-12 q/ha more than for cultivars previously assigned to different zones.

In view of development of livestock farming, grain fodder crops are gaining much importance. During the period of the 10th Five-Year Plan, some new, highly productive spring barley varieties were zoned--Donetskiy 6 and Donetskiy 8, Dneprovskiy 485 and Slavutich; this also applies to winter barley--Oksamit and Zimran--and oats--Sinel'nikovskiy 21, Kirovskiy and Belozernyy. Several of the new varieties of barley and oats are referable to the intensive type; however, they are still inferior to the best foreign cultivars with respect to resistance to lodging. Here we have a wide field of activity for our breeders, so that this weak point can be eliminated within the next few years.

A major achievement of Soviet breeding work is the development of the world's first highly productive varieties of peas with nonshattering [not falling] seeds--Neosypayushchiysya 1 and others, cultivation of which opens the way for broader introduction of industrial technology for the production and harvesting of this crop, which is a valuable source of feed protein for livestock farming.

Perceptible advances have been made in development and introduction of industrial technology for raising rice, corn and sunflowers. The All-Union Scientific Research Institute of Rice developed the industrial technology for growing rice, and it has gained international recognition. Broad introduction thereof yielded, in 1980, the largest harvest in the history of rice growing in our country--42.6 q/ha planted area.

Industrial technology for growing corn to be used for grain involves the use of a set of modern, highly productive machines, a proper system for tilling the soil, new, highly productive hybrids and highly effective herbicides. Even in 1980, with its inclement weather, the harvest of corn grain raised with industrial technology constituted 36.2 q/ha, versus only 28.7 q/ha with the usual technology. Use of industrial technology to grow sunflowers made it possible to harvest 4.8 q/ha more seeds last year than with the usual technology. A record harvest of raw cotton was produced in 1980 chiefly as a result of broad introduction of industrial technology for growing and harvesting cotton, as well as the use of highly productive, wilt-resistant cultivars.

Intensification of agriculture and conversion to industrial methods of agricultural production make it necessary to introduce qualitatively new cultivars with high and stable productivity, better nutritional, technological and feed qualities, resistance to adverse environmental factors, lodging, diseases and pests. At the same time, the breeding of many crops does not conform with the modern demands of intensive farming. Spring cultivars of the intensive and, especially, the semi-intensive types are needed for several regions of our country, that would ripen rather early, and this applies in particular to spring wheat for Siberia and Northern Kazakhstan. Most of the cultivars of grain crops are not resistant enough to lodging, rust and other diseases. The yield potential of leguminous and grain [or groat] crops is low. There is a lag in breeding early and moderately early ripening corn hybrids, early, highly productive sunflower hybrids derived with the

use of CMS, single-shoot hybrids of sugar beets, and high-grade, wilt-resistant cultivars of cotton, particularly the thin-fiber type.

There are some serious flaws in seed growing of feed, grain, leguminous, oil-bearing and other crops. This creates a chronic shortage of high-grade varietal seeds, leads to a shortfall in planned targets for raising them, and for this reason new cultivars are being slowly introduced into production.

In the draft of the CC CPSU for the 26th Party Congress, acceleration of scientific and technological progress is considered as an integral part of the main target of the 11th Five-Year Plan: to provide for continued improvement of the welfare of the Soviet people. The Party again calls the attention of agricultural scientific workers to the fact that their contribution must be even greater to the development of productive forces and solution of socioeconomic problems of rural areas.

Comrade M. S. Gorbachev, member of the CC CPSU Politburo and secretary of the CC CPSU, in his speech at the All-Union Agronomic Conference, called special attention to intensification of ties between specialists and science, active introduction of its latest advances into production practice. Many scientific research institutions are making a major contribution to the development of agriculture. At the same time, by far not all scientific research conforms with the increasing demands of agricultural production. There are quite a few instances where studies are conducted without consideration of its needs. Life has shown that an effective form of utilization of scientific advances is integration of science with industry by means of creating scientific-production and production-scientific associations.

In the Moldavian SSR, the Hybrid and Selektsiya [breeding] scientific-production associations were established and are working with success; they implement accelerated introduction of new cultivars and hybrids into production. Recently the Dnepr NPO [scientific-production association] was organized at the All-Union Scientific Research Institute of Corn. Its task is to develop and introduce at an accelerated pace early ripening and moderately early ripening hybrids of corn, for which industry experiences such an acute need. Scientific research institutions have already developed early ripening hybrids--Zapadnyy D5TV, Krasnogradskiy 62 MV and Odesskiy 80 MV--which are growing well in Poles'ye and the forest-steppe zone of UkSSR, central chernozem regions and Povolzh'ye. There is still much to do for the Dnepr NPO for the new hybrids to speedily appear on the vast corn fields.

The "Oil-Bearing Crops" NPO was opened at the All-Union Scientific Research Institute of Oil-Bearing Crops and its experimental network. The All-Union Institute of Breeding and Genetics and the All-Union Scientific Research Institute of Oil-Bearing Crops imeni V. S. Pustovoyt developed the Odesskiy 91 and other sunflower hybrids, as well as early ripening cultivars notable for coordinated maturation, uniform plant height, resistance to diseases, particularly gray and white rot, false mildew and broom rape. The Odesskiy 91 hybrid has already been zoned, and the others have been deemed promising. The task of the "Oil-Bearing Crops" NPO is to produce the required quantities of parential lines and hybrid seeds, as well as high-grade seeds of higher reproductions so that, already in the next few years, the sunflower hybrids and highly productive early ripening cultivars would be used extensively in our country's sovkhozes and kolkhozes.

To intensify breeding of leguminous and grain crops, the All-Union Scientific Research Institute of Leguminous and Grain Crops must improve coordination of

scientific research, increase the scope of work, make broader use of new base material and new breeding methods. The question of creating specialized seed-growing zones for peas, buckwheat, millet, lupine, alfalfa, clover and other crops is now ripe for areas with the soil and climate conditions that are the most favorable for these crops.

Intensively developing agriculture is making new and increasing demands with regard to the cultivars that are being developed and technology that must aid in accelerated growth of agricultural production and improvement of the product quality.

Already in the first year under the 11th Five-Year Plan, scientific research institutions have much to do with regard to implementing the special-target complex programs for grain, leguminous, groat crops and corn, rice, sugar beets. The programs dealing with solving the most important scientific-technological problems of growing and harvesting feed crops, soybeans, potatoes, sunflowers, long-stemmed flax, vegetables and cucurbits require special attention.

Special attention will be directed toward faster development of new, highly productive varieties of winter and spring wheat, rye, grain fodder crops, early and moderately early ripening corn hybrids, as well as sunflower hybrids based on the use of CMS. In beet growing, single-seed varieties with high germination quality and hybrids that combine high sugar content, high productivity and early maturation must be developed.

In order to augment the resources referable to feed plant protein, the industry will be given some new, highly productive cultivars of leguminous crops with non-shattering seeds, adapted for mechanized cultivation and harvesting, as well as new, earlier ripening cultivars of soybeans, lupine, rape, annual and perennial leguminous grass yielding large amounts of protein per hectare on highly fertile soil. Breeders must develop feed varieties of winter wheat, varieties of barley, oats and corn with high protein content and essentialy amino acids, particularly lysine, as well as grain cultivars with large biomass and high grade of the non-grain part of the harvest. There are plans for development and introduction into practice of some new and valuable varieties of potatoes, vegetables, fruit and berry crops.

There will be continued complex development and broad introduction of industrial technology for raising corn, sunflowers, soybeans, sugar beets, potatoes and vegetables.

The enormous army of scientists working in the field of agriculture will concentrate all its efforts and knowledge on implementation of the decisions of the 26th CPSU Congress, as well as the large-scale scientific technological programs and tasks approved for the 11th Five-Year Plan. Thereby, they will make a worthy contribution to scientific and technological progress in agriculture.

10,657
CSO: 1840/531

UDC: 632.982

EXPERIENCE WITH ULTRASMALL-SCALE SPRAYING

Moscow ZASHCHITA RASTENIY in Russian No 3, Mar 81 p 37

[Article by V. M. Agarkov, sector head at the VNIIPANKh GA, T. M. Vereskun, junior scientist at VIZR, and L. D. Trebukh, junior scientist at the VNIIPANKh GA]

[Text] The VNIIPANKh [expansion unknown: All-Union Scientific Research Institute of ...] GA [Civil Aviation], VIZR [All-Union Institute for the Protection of Plants], VNIIGINTOKS [All-Union Scientific Research Institute of .... remainder of expansion unknown] and other institutes have developed the technology for airborn ultrasmall-scale [small capacity, or fine spray?] spraying for the control of Eurygaster integriceps stinkbugs, rustic shoulderknot moths [Apamea sordens Hufnagel], forest pests that bore pine needles and leaves, locust and Colorado beetles.

This method is being introduced extensively. We should like to share the experience we have gained in the course of our work at the Zatobol'skiy Sovkhoz in Kustanayskaya Oblast.

Fields were sprayed against the rustic shoulderknot moth from an An-2 aircraft equipped with a series-produced sprayer; rotary liquid dusters designed by VNIIPANKh GA were installed on the bars. A tank made from the series-produced D-300-AM-42 was used to load the chemical, in which a gear-driven pump, type NSh-46U was used instead of the AM-42 rotary pump. Its output constituted 115 liters/min. The aircraft tank was filled in 14-15 min by pumping "ritsifon" from 50-liter tanks. A container with a wide (at least 60 mm) tank filler was found to be the most convenient--metal, plastic and aluminum tanks with 25-50 ℓ capacity; barrels with a capacity of 100-200 ℓ are also suitable, although their large weight makes loading and unloading more difficult. The design of the loader makes it possible to remove pesticide from such a container, the residue usually not exceeding 1 ℓ. A 200-ℓ barrel with open top, for pouring out this residue, was placed on the loading platform.

Narrow-necked glass bottles are utterly unsuitable, since it is impossible to pump the liquid out of it. Unpacking them takes much labor and time.

In the event of malfunction of the aircraft or equipment, emergency discontinuation of spraying due to meteorological and other causes, as well as following morning and evening dusting, it is mandatory to pour out the remainder of the insecticide out of the tank, rod and pump unit back into the plant container. The dusters are cleaned and washed in diesel fuel, and after completion of work diesel fuel is used to flush the pump and loader hoses (using water is not allowed).

Table

Dusting method	Distance from airport to field (km)	Dusted area (hectares)	Flying time (min)	Coverage per flight hour (hectares)
Shuttle	3	267	59	271.2
Sectional, two fields lined up at a distance of 3 km	14	706	154	274.8
Sectional	16	524	80	393.0
Sectional, two fields lined up	15	614	90	409.2

During the dusting period, which was in the morning and evening hours, the meteorological conditions were good. Technical efficiency constituted 80-87.5%. The highest productivity was obtained with the sectional method of dusting (see Table). It was found that the most advantageous use thereof is on unbroken tracts, where hourly output of the An-2 aircraft increased by 31-34%. We strongly recommend the sectional method for the farms in Kazakhstan!

The possibility of reducing additional take-off strips is a rather important advantage of the ultrasmall-scale dusting method. In view of the fact that one can dust up to 400 ha per flight, the approach distance does not play a substantial role.

It is convenient to use plant products, which rules out preparation of working liquids. This feature is particularly valuable in arid regions. Optimum use of special products is one of the means of preventing environmental pollution by residual pesticides. For example, this new method made it possible to reduce the use of chlorophos from 1.2-1.6 to 0.9 kg/ha (for the active constituent).

It is planned to equip farm aircraft with special radio equipment in the next few years, which would make it possible to work without signal men. This would relieve the farms from many organizational problems and would increase the productivity of aviation equipment.

10,657
CSO: 1840/527

UDC: 632.937

BIOLOGICAL METHODS TO BE MOVED TO THE RESORT ZONE

Moscow ZASHCHITA RASTENIY in Russian No 3, Mar 81 p 14

[Article by V. K. Belov, deputy chairman of the PNO Rossel'khozkhimiya (Production-Scientific Association of the RSFSR for Use of Chemistry in Agriculture), head of the board for plant protection, and V. P. Filatov, deputy head]

[Text] Recently, at a meeting of the production-scientific council for biological protection of plants under the Administration for Plant Protection of the Rossel'khozkhimiya Association, a decision was made to expand the use of the biological method in resort regions of the Russian Federation.

In the USSR, as in many countries of the world, interest has grown significantly in recent years in biological control of pests, diseases of agricultural plants and weeds.

In the Russian Federation, this method began to be used extensively in 1970, and in 1979 it was already used over 7.9 million ha [hectares] of land, which is 16 times more than 10 years ago. In closed ground, use of the biomethod increased from 0.5 m^2 to 33 million m^2 in this period. This method of plant protection is particularly irreplaceable in areas where use of pesticides is not allowed or restricted, in particular, resort areas.

Grain, commercial crops, feed, vegetables, grapes, tea, citrus fruit, fruit and berries are raised on the coast of the Black Sea in Northern Caucasus. In recent years there has been rapid development of vegetable growing in protected soil, in order to meet the year-round (needs of vacationers) for fresh vegetables and greens.

The climate and natural conditions of this zone and the wide assortment of crops raised there are involved in the rapid development of pests, which produce several generations per year, and in intensive plant diseases. All this makes it imperative for farmers to institute protective measures for 10 months [per year?]. It must be stated that the volume of work done in this zone against pests and diseases doubled in the last 8 years, constituting about 0.6 million ha. A large share of this work involves protection against quarantinable pests--the fall webworm moth [Hyphantria cunea Drury], Oriental peach moth [Ernarmonia molesta], Colorado beetle and Phylloxera. The chemical method is used the most, and this presents the danger of accumulation of residual amounts of the agent in vegetables and fruit that come directly to the consumer's table, as well as of drainage of agents into water reservoirs.

In the last few years, agricultural agencies have taken several steps to expand the biological method for protection of plants against pests and diseases in the zone. The Sochi Experimental Bioplant has started up; it produces Trichogrammatidae; egg parasite breeding has been organized in Anapa. A biological laboratory has been set up in Sochinskiy Rayon to increase the scope of utilizing biologicals. More biologicals--dendrobacillin, b.toxibacillin and BIP--are being delivered to farms in Chernomor'ye. Work is being intensified for detection, keeping records of and preserving entomophages.

However, the project will not be brought to its fruition if the valuable beginning is not supported by other concerned agencies, in particular the RSFSR Ministry of Forestry, RSFSR Ministry of Housing and Municipal Services, RSFSR Goskomvinprom [State Committee for the Wine (or grape?) Industry] and Glavmikrobioprom [Main Administration for the Microbiological Industry].

Thus, enterprises in the system of municpal services in resort locales still use only chemicals to control pests, although they could be well-replaced with safe biological agents, for example, microbiological products against leaf pests and the Colorado beetle, and Aschersonia against whiteflies, etc. That this is quite feasible is indicated by the experience gained in Anapskiy Rayon, where knowledgeable use of Trichogrammatidae allows for effective control of leaf pests on vegetable crops. The high efficacy of Phytoseilus (?) to control spider mites was demonstrated in use thereof in the hothouses of the Dagomysskiy Sovkhoz.

There are several scientific institutions in the resort zone, whose tasks include development and introduction of protective measures, including the biological method. We refer to the Scientific Research Institute of High-Altitude Horticulture and Flower Growing, the experimental station of the All-Union Institute for the Protection of Plants, the Adlerskiy Experimental Vegetable Station, Anapa Zonal Experimental Station, Sochi base of the All-Union Scientific Research Institute of Biological Methods of Plant Protection. But only two of these, the experimental station of the All-Union Institute for the Protection of Plants and Anapa Experimental Station, have begun research on use of the biomethod. And already some results have been obtained: it was proven that it is possible to reduce drastically the use of chemicals at the Mikhaylovskiy Pass Sovkhoz gardens (40 ha). The station is also exploring the possibility of breeding aphidophages on artificial nutrient media. These parasites are being tested on cucumbers in the hothouses of the Pobeda Sovkhoz. The Anapa Station has tested the efficacy of bitoxibacillin against the European grape moth and Turkish weevil in vineyards.

Unfortunately, no one in the resort zone is working on problems of integrated protection of plants, which is so necessary there. Nor is anyone working on a number of other pressing problems, for example, control of the spider mite, mildew and oidium in vineyards; deleterious factors in fruit and berry, citrus, ornamental crops, etc.

Due importance is not being given to demonstrating, considering and estimating the biological activity of useful insects, accumulation of which helps eliminate or reduce chemical treatment.

The question of eradicating quarantinable weeds is particularly acute; we refer to Ambrosia ragweed, which causes allergy in man during the flowering period. Here too, the biological methods of control would be very appropriate.

It is imperative to provide for centralized production and mass-scale breeding of phytoseilus, cryptolemus, trichodermin, aschersonia and other organisms in farm

and interfarm laboratories of concerned ministries, agencies, organizations and enterprises. This work must be done following a unified program. Special consideration should be given to the question of construction and operation of the Anapa Biological Plant for Trichogrammatidae Breeding. Construction should be coordinated with the general plan for urban building.

It would be expedient to organize a biological laboratory and two centers for diagnostics and prognostics in order to introduce biological agents for the protection of plants in the farms of the region of Anapa, Gelendzhik and Novorossiysk.

The scientific institutions of the resort zone should join forces to develop biological methods, intensify propaganda about them, by means of series of demonstration experiments, training farm specialists and publishing relevant literature.

We hope that the concerned organizations and agencies will voice their opinion on the problem raised, and that they will show the ways and means of solving it.

10,657
CSO: 1840/527

UDC: 001.8+631.527

METHODOLOGICAL PROBLEMS OF MUTAGENIC PLANT BREEDING

Moscow VESTNIK SEL'SKOKHOZYAYSTVENNOY NAUKI in Russian No 3, Mar 81 pp 138-145

[Article* by Ye. V. Vilenskiy and Ye. Ya. Zyablitskaya, candidate of biological sciences]

[Text] The wide use of mutagenesis in plant breeding has yielded significant achievements with respect to development of new and valuable cultivars and mutants. However, many problems of plant mutagenesis have still not been resolved. This seminar, which was organized by the "Radiation Mutagenesis and Plant Breeding" section of the Council for Agricultural Radiology under the Presidium of VASKhNIL [All-Union Academy of Agricultural Sciences imeni Lenin], jointly with the All-Union Scientific Research Institute of Agricultural Radiology and Moscow department of the All-Union Scientific Research Institute of Plant Growing, dealt with methodological problems of mutagenic plant breeding. Scientists and specialists from 32 institutions of VASKhNIL, USSR Ministry of Agriculture, USSR Academy of Sciences, academies of sciences of Union republics--about 180 people in all--participated in the seminar, which convened in the Agriculture Pavilion of the Exhibition of Achievements of the National Economy of the USSR.

N. A. KORNEYEV, academician of VASKhNIL, opened the seminar. A. A. SOZINOV, academician of VASKhNIL, first vice-president of VASKhNIL and chairman of the Council for Agricultural Radiology under the presidium of the VASKhNIL, delivered the opening address.

V. K. SHCHERBAKOV (Moscow department of VIR [All-Union Scientific Research Institute of Plant Growing]), chairman of the "Radiation Mutagenesis and Plant Breeding" section, discussed the current problems of mutagenic plant breeding. He observed that mutagenic factors are finding increasing applications in plant breeding. According to the data of FAO/MAGATE [Food and Agriculture Organization/IAEA], more than 500 new cultivars have been developed to date through the direct reproduction of mutants and use thereof in hybridization, 200 of which are referable to grain, leguminous and other agricultural crops and about 300 to vegetatively reproducing and ornamental plants. An even larger number of forms of mutant origin are undergoing testing. In our country, more than 30 new valuable cultivars have gained recognition and wide distribution, including 6 wheat cultivars, 3 barley, 3 oats, 6 lupine, 2 soybeans, 1 sunflower, 2 bean, 1 tobacco, 1 peavine [Lathyrus] and others. More than 60 valuable mutant varieties are undergoing State testing.

*All-Union seminar, Moscow, 25-28 September 1980.

These examples prove that the method of induced mutagenesis, along with other breeding methods and in combination with them, result in development of new plant cultivars that can compete with those now existing. The method of induced mutagenesis has become the mass scale breeding method.

At the present time, mutagenic factors are used for breeding in the following main directions: induction of macromutations, selection of mutants, evaluation and use thereof as new cultivars (direct use of mutants); use of mutants in crosses with the original or other forms to improve characters of the latter, as well as to produce heterotic hybrids; enhancement of variability or change in nature of variation of the main characters in populations of agricultural crops as the basis for progressive improvement of these characters by means of selection; inducing mutations in crops that multiply through vegetation; intensification or depression of crossing-over (crossing over of chromosomes) in hybrids; overcoming the unhybridizability of remote forms, depression of self-incompability reaction of plants; increasing the frequency of interchromosomal translocations in remote hybrids; polyploidization of cells and organisms; stabilization of polyploids with corresponding increase in their fertility and productivity; induction of haploid and diploid apomixia [parthenogenesis]; development of chimeras of practical value, as well as change in structure of existing chimeras, etc.

Mutation research is important to more than breeding; it has a strong influence on progress in allied branches of science--genetics, physiology, biochemistry, systematics and others.

Mutants are used to study photosynthesis, transport of metabolites and biochemical pathways in plants; analysis of interactions between soil and plants; analysis of structural distinctions of plants to improve their absorption of solar energy, obtain maximum harvests, reduce loss of harvest; regulation of the life cycle of plants by altering photosynthesis, temperature and other conditions in order to develop varieties with higher potential productivity, that are more suitable for an intensive system of agriculture; to study development of fruit, tubers and seeds in order to design better cultivars; investigation of symbiotic phenomena, such as nitrogen fixation; analysis of interactions between host and parasite, and signs of plant resistance to pathogens; improvement of plant adaptation and enhancement of their resistance to stress; evolutionary genetic studies of farm crops; study of ecology of mutant genes and population-environment interactions; investigation of reproductive system and such phenomena as male sterility and restoration of fertility; development of better in vitro systems to cultivate plant cells and tissues, as well as regenerate plants; in vitro study of physiological and biochemical problems related to upgrading plants; in taxonomy; genetic research on phenomena of polyploidy, aneuploidy, heterosis, foreign gene transmission, etc.; cytological marking in making genetic maps, identification of chromosomes, as well as in gene engineering; analysis of general phenomena of heredity and gene interaction.

N. D. TARASENKO (Central Siberian Botanical Garden, SD USSR AN [Siberian Department of the USSR Academy of Sciences]), doctor of biological sciences, dealt with the mutagenic efficacy of ionizing radiation and chemical mutagens in his paper. It was noted that ionizing radiation, particularly fast neutrons, is effective in obtaining chromosomal aberrations. It is desirable to use chemical mutagens that have high specificity of action on genetic material to induce gene mutations in

diploid plants (or functionally diploid). The existing procedures for introducing chemical mutagens, by means of soaking dry or presoaked seeds in solution, do not take into consideration such distinctive features as the existence of functional differences between cells of the stem and root meristem of seeds and shoots. N. D. Tarasenko et al. developed experimentally a series of new methods that increase the incidence of hereditary changes by 2.0-2.5 times, as compared to conventional techniques. They include treatment of stem meristem with chemical mutagens, treatment of embryos (on the example of barley) with ethylmethane sulfanate and nitrosomethyl urea 48-72 h after fertilization. The flowering glumes are cut by two-thirds for better penetration of mutagens to the gynaecium [or ovary] on the spikes. It was found that both mutagens are highly effective. However, nitromethyl urea was more toxic. A method was also proposed that is based on combined use of specific enzymes that break down the seed coat and cell walls. Studies revealed that there is 2-3-fold increase in sensitivity to mutagen and frequency of mutations in M_2 if barley seeds are soaked in a solution of pectinase and lysozyme, together with ethylmethane sulfanate. A new, effective method of increasing the frequency of mutations, based on combined treatment of seeds with phytohormones (auxins) and chemical mutagens was experimentally tested.

I. V. CHERNYY (Institute of Cytology and Genetics, SD USSR AS), candidate of biological sciences, reported on the role of mutations and hybridization in developing new forms of wheat. V. P. MAKSIMENKO (Siberian Scientific Research Institute of Plant Growing and Breeding, SD VASKhNIL), candidate of agricultural sciences, delivered a paper entitled "Results of Mutagenic Wheat Breeding." Exposure of Lutescence 7/3634 wheat seeds to radiation in a dose of 50 Gy [Gray units] produced a mutant that was subsequently zoned under the name of Novosibirskaya 67. Work on development of this cultivar was conducted jointly with the Institute of Cytology and Genetics, SD USSR AS (P. K. Shkvarnikov, I. V. Chernyy). At the present time, over 50% of the area occupied by all of the wheat in Novosibirskaya and Tyumenskaya oblasts is planted with Novosibirskaya 67 wheat.

V. P. Maksimenko singles out the following principles, which are followed in developing the new cultivars: mutants must be produced from the best cultivars (including local ones) that only have a few flaws. One should not use dense-spike forms to develop varieties resistant to lodging, since further reduction of straw leads to excessive spike density and lowers productivity; it is more convenient to select earlier and late ripening forms during the heading period and at the start of the yellow-ripe stage. It is best to isolate rare dominant mutations from first-generation spikes.

G. N. OKHRIMENKO (Institute of General Genetics, USSR AS), candidate of biological sciences, talked about the specific distinctions of mutagenesis when plants are exposed to X-rays at the early stages of embryogenesis. Winter-hardy winter wheat cultivars--Ul'yanovka, Alabasskaya, Al'bidum 114, Mironovskaya 808--were exposed to radiation in a dosage of 4 Gy during the period of spike flowering, as well as 1-15 days after blooming. It was found that the frequency of specific types of changes in M_1 and M_2 varies, depending on irradiation time. Maximum diversity of mutations was observed after treatment of proembryos. After termination of embryo formation, there was a decrease in spectrum of mutations, but increase in frequency of different types of mutations. Among the M_1 mutants, a significant share consisted of homozygotic forms that did not segregate in subsequent generations. Use of the method of irradiating developing embryos increased by 1000 times the incidence of short-stemmed mutants, as compared to irradiation of dormant seeds.

The paper of I. D. MUSTAFAYEV, academician of the Azerbaijan Academy of Sciences, and G. V. RYSKAL', candidate of agricultural sciences (Institute of Genetics and Breeding, Azerbaijan Academy of Sciences), "Induced Mutagenesis in Breeding Wheat for Quality" (paper delivered by G. I. Immamaliyev), reported that there are great difficulties involved in increasing protein content of grain. A negative correlation was observed between protein content and productivity, on the one hand, protein content and essential amino acid content (primarily lysine), on the other. Some promising mutant strains were obtained from Gyurgyana 3 and Bezostaya 1 winter bread wheat, as well as Sary Bugda durum, by means of chemical mutagens. Mutant strains M-236, M-288 (originating from Gyurgyana 3) and M-36 (from Bezostaya 1), which had the highest protein content turned out to produce a small harvest. The highly productive strains, M-255 and M-293, were on a par with the original cultivars with regard to crude protein content. M-245 (spherococcoid) proved to be the most valuable strain, being superior in all elements of productivity to the initial cultivar, Gyurgyana 3, with 20-47% protein content in the grain. Of great importance in breeding for quality is not only development of mutants and cultivars with high protein content, but a good balance of amino acids. Mutant strains M-245 and M-236 are interesting; they contained a higher percentage of lysine than the original variety. It is imperative to take into consideration such parameters of grain quality as glassiness and gluten content. I. D. Mustafayev and G. V. Ryskal' developed mutant speltoid strains with high gluten content (52%) and glassiness (95%).

V. I. LYSENKOV (Moscow department of VIR) demonstrated the results of using chronic ^{60}Co γ-radiation (5.0-0.9 R/h, 16 h/day) during the entire vegetation period. A total of 454 families were analyzed. Altered forms were isolated in M_2, and 165 forms referable to the Il'ichevka cultivar, which are of interest for breeding purposes.

Morphobiological and biochemical studies of inheritance of altered types of plants were conducted for 4 years. Of greatest breeding interest are two mutant strains, GP24 and GP81. GP24 was induced by means of chronic γ-radiation (2640 R, 1.7 R/h). Plant height was 100-105 cm, the spike was white, glabrate, 10-12 cm in length. This strain has 17% more protein than the standard, and 23% more than the initial cultivar (in relative units). The strain is resistant to brown rust (Puccinia) and powdery mildew.

GP81 was developed in 1973; its spike is awnless, cylindrical, glabrate and 12 cm long. Mean stalk height is 100-105 cm. The grain is large and weight per 1000 grains is 50 g. This strain is 28% better than the initial cultivar with regard to protein content and 25% better than the standard.

Short-stemmed, nonlodging mutants of winter wheat were obtained by means of chronic γ-radiation, and they are notable for good and productive bushiness, rather large kernel, high levels of protein and some amino acids in the grain.

G. F. ANFINOGENOV (Scientific Research Institute of Agriculture of Central Parts of the Nonchernozem Zone), candidate of agricultural sciences, discussed development of winter rye mutants that are resistant to diseases. This work was done together with the Moscow department of the VIR (V. K. Shcherbakov).

Several of the papers delivered at the seminar dealt with mutagenesis in barley.

I. G. SHVEDOV (All-Union Institute of Breeding and Genetics), candidate of agricultural sciences, delivered a paper entitled "Development of a Mutant Gene

Collection for Barley." There are no genetic sources of winter barley in the world-wide collection that would combine good winter hardiness and resistance to lodging and diseases. As a result of many years of work, an extensive and diverse stock of genes of mutant forms of barley based on cultivars bred domestically (Odesskiy 17, Odesskiy 31, Odesskiy 46) was created, which consists of more than 600 different forms. The main value of the new base material is that it has the winter hardiness of the world's best cultivars and, in some cases, is superior to them for this character. The base material that has been created is used widely by breeders in the Ukraine and Moldavia, scientist members of the Coordination Center of CEMA for breeding and genetics, from the People's Republic of Bulgaria, GDR, Polish People's Republic and Socialist Republic of Rumania. The mutant specimens are a good addition to the gene pool [stock] of natural embryonic plasma of winter barley, I. G. Shvedov and his coworkers developed a new, highly productive, more hardy and resistant to lodging, "bimanous" [?] mutant cultivar of barley, Odesskiy 9, which has proven itself well in a competitive strain test.

M. R. KOZACHENKO (Ukrainian Scientific Research Institute of Plant Growing, Breeding and Genetics imeni V. Ya. Yur'yev), candidate of agricultural sciences, told about the use of physiologically active substances (PAS) in mutagenesis. Before exposing Donetskiy 4 variety of barley seeds to ^{60}Co γ-radiation, they were soaked for 18-24 h, separately in solutions of levomycetin, cysteamine, streptomycin and cysteine. After irradiation (50-200 Gy), vacuum infiltration was used to introduce heteroauxin (0.005 and 0.05%) into El'gin and Donetskiy 8 varieties of barley seeds. Before irradiation, in some of the variants, helium-neon laser beams were used (OKG-12, 6328 Å, 0.02 mW/cm^2, 30-60 min). The PAS used were found to be either protective agents or sensitizers of genetic effects of mutagens, depending on their specificity and dosage. It was possible to increase the incidence of mutations by 1.4-2.7 times with the use of PAS. In some cases, PAS reduced the frequency of mutations: cysteine and cysteamine (0.01 M) with irradiation and heteroauxin (0.05 and 0.005%) with the use of **nitrosoethyl** urea. Preliminary use of laser beams on the seeds increased by 2.1 times the incidence of radiation-induced mutations (with a dosage of 50 Gy) in the El'gin variety. The combination of physical and chemical mutagens with **modifiers** made it possible to induce mutants of breeding value.

The paper of V. T. MANZYUK, doctor of agricultural sciences, and Ye. V. BIBIK (Ukrainian Scientific Research Institute of Plant Growing, Breeding and Genetics imeni V. Ya. Yur'yev) dealt with mutational breeding of barley for protein content. It was experimentally demonstrated that protein content of grain diminishes in strains of barley cultivars Donetskiy 8 and El'gin under the influence of nitrosomethyl urea. The use of modifying factors (kinetin or extract from germinating seeds) increases the number of mutant strains with protein content in grain of more than 14-15%. Unfortunately, the authors did not identify the compounds in the extract from germinating seeds.

Development of barley mutants resistant to powdery mildew was the topic of G. E. KAVATSS and V. T. Eyzenberg (Institute of Biology, Latvian Academy of Sciences), candidates of biological sciences. Seeds were exposed to fast neutrons (10 Gy). Selection of resistant forms was made among M_3 families according to invasion of shoots by C_5 or D_7 strains of mildew. Resistance of each plant to 2-5 strains of powdery mildew was tested by infecting leaf cuttings kept in 0.004% benzimidazole solution. The selected resistant families were tested again in M_4. It must be stressed that the incidence of mutations of barley resistance to this disease,

induced by fast neutrons, was more than 10 times lower than chlorophyll mutations. The obtained donors of resistance to powdery mildew were handed over to the Priyekule and Stende breeding stations.

The paper of O. V. BLYANDUR (Kishinev Agricultural Institute), candidate of biological sciences, "Mutational Breeding of Corn," submitted the results of many years of research on development of forms seldom encountered in the worldwide collections. Nonsegregating homozygotic families were obtained in M_2 for the first time with corn. This phenomenon is of enormous significance to breeding, as a means of accelerating homozygosity. O. V. Blyandur and his coworkers obtained 224 mutants, which were studied from M_3 to M_{14} with inbreeding. The isolated mutants had a set of characters of economic value (high OKS [general combinative capacity?] and productivity, high tryptophan content). High-protein mutants were also isolated that had low zein content and high lysine and tryptophan levels. The method of linear regression was used to determine the general trend of variability of protein content in hybrids, and relation between its constituents with change in level thereof. General combinative capacity of the mutants, determined with the use of the mathematical model of Griffing, revealed appreciable genotypic differences between combinations and made it possible to define the variances in combinative capacity as a function of the tester used. The fluctuations in OKS effects ranged from 0.7 to 13.4 q/ha.

Experimental mutagenesis of inbred corn made it possible to create a phenotypic collection of mutant strains, which were examined for economically valuable characters: hardiness, multiple ear formation, early ripening, complex resistance to white blister [Ustilago maydis], bacteriosis and ear fungus, multiple rows, high OKS, higher (by 2.1-5.6%) protein and lysine content of the kernel, similar to Opaque-2, which is used extensively as base material for breeding.

G. A. DEBELYY (Scientific Research Institute of Agriculture of Central Regions of the Nonchernosem Zone), candidate of agricultural sciences, reported on methodological problems of mutagenic breeding of leguminous crops. His many years of research established that many chemical mutants have greater mutagenic efficacy (NMM [nitrosomethyl urea] and DES for peas, NMM and NEM for vetch [Vicia], NMM for lupine), as compared to γ-radiation. The high efficacy of the mutagens coincides with a broad spectrum of mutations. After seeds are exposed to γ-radiation, a large number of mutants are produced with altered length of vegetation period. Many mutations of quantitative characters were induced by treatment with DEM and DMS. For Nemchinovskiy 846 lupine, a concentration of 0.015-0.02% NMM was the most effective and for Nemchinovskiy Siniy--0.005-0.03%. The maximum yield of viable mutations is obtained with γ-radiation and chemical mutagens in doses that are below or on the level of critical ones. The coincidence of high sensitivity and mutability of pea cultivars, which was demonstrated in the experiments, is not a consistent phenomenon. Thus, the Barkhatnaya cultivar of vetch, which has large seeds and is sensitive to mutagens, was not outstanding in mutability, while Nemchinovskaya 2486, a hybrid cultivar, demonstrated the largest number of mutations and broad spectrum thereof. G. A. Debelyy stressed that it is imperative to use mutagen treatment on cultivars that are usually more productive, promising and that have been zoned, for the successful use of the method of induced mutagenesis. In spite of the discovery of active chemical mutagens and development of effective treatment methods, mutants of breeding value are obtained only if a large amount of material is treated. Methods were proposed to increase the efficacy of selection of mutations. In experiments with peas and spring vetch conducted to increase the yield of mutations and reduce labor-consuming

operations, it is recommended that seeds be selected in M_1 from the lower fruiting plant nodes, which have nonchlorophyll spotty leaves, morphological deviations, normal fertility, altered shape, size and color of grain for sowing in M_2. The number of mutants among the offspring of such altered plants constitutes up to 12%, versus only 1.5% in the offspring of unchanged plants.

Ye. S. ALEKSEYEVA (Kamenets-Podol'sk Agricultural Institute), doctor of agricultural sciences, delivered a paper entitled "Mutational Breeding of Buckwheat." In 20 years of work dealing with buckwheat breeding, this author singled out the following stages in the use of mutagenesis: first, study of the effects of different doses of γ-radiation and chemical mutagens on seeds. As a result of selection in M_2 of highly productive seeds, the zoned cultivars, Aelita and Lada, were obtained from irradiated buckwheat seeds of the Radekhovskaya Uluchshennaya cultivar (300-400 Gy), while treatment of seeds of the same cultivar with nitrosomethylurea (0.01%) yielded the promising variety, Orbita, which is undergoing State testing; the second stage refers to repeated use of mutants in the mutation process and combined treatment with radiation and chemical mutagens. As a result, diversified breeding material was obtained from Viktoriya buckwheat seeds, from which the promising cultivar, Podolyanka, was developed; at the third stage, new base material can be obtained by treating plant pollen with mutagens. Chronic exposure of vegetating plants to radiation on the gamma field of Kishinev Agricultural Institute, particularly when it was repeated, made it possible to create a wide spectrum of mutations, as compared to irradiation of seeds. Mutants have been isolated that are notable for short stems and shorter vegetation period. It was established that treatment of buckwheat hybrid seeds with mutagens increases the frequency of mutations of large-fruited and early ripening forms of hybrids: ordinary grain × large grain (Viktoriya × Mayskaya); the fourth stage makes it possible to use new mutagenic factors, laser beams, magnetic and electromagnetic fields. It is very important to evaluate the material for technological and biochemical qualities of grain. Without such evaluation, there could be drastic deterioration of grain quality in the course of breeding, concurrently with growth of productivity.

Several papers delivered at the seminar were concerned with the distinctions of mutagen effects on vegetable crops. S. T. DOLGIKH (Scientific Research Institute of Vegetable Farming), doctor of agricultural sciences, singles out the following positive changes in quantitative characters, which can be induced by the mutagenesis method: most valuable forms with shorter vegetation period, determinant period, compact arrangement of fruit and coordinated fruit-bearing in Solanaceae, Cucurbitaceae and legumes. With regard to qualitative characters, mutants with higher sugar, ascorbic acid content and improved fruit flavor are of interest.

V. V. KHRUSTALEVA, candidate of agricultural sciences, and L. N. LISTIKOVA (Moscow department of VIR) discussed the use in hybridization of mutants obtained from currant-like tomatoes. By means of selection in the offspring of vegetating tomato plants exposed to chronic γ-radiation, strains were obtained that had a set of characters of breeding value: low stature, determinance, 10-15 g fruit (versus 0.7-2 g in the control), profuse and coordinated fruit bearing, high ascorbic acid and sugar content, increased resistance to phytophthora [blight] invasion. The best mutant strains were crossed with Belyy Naliv and Ottawa 60 tomato cultivars. The obtained hybrids are outstanding for profuse fruit bearing (with mean fruit weight of 20-40 g) and increased resistance to blight.

V. I. KOZAK and N. A. KORCHEMNAYA (Moscow department of VIR) discussed the use of currant tomato mutants in heterotic breeding. Mutants were produced that had a shorter (14 days) vegetation period, even in years that were inclement for tomatoes, as compared to the standard and initial form. Mutant strains were found with a large amount of dry substances (6.6-7.8%) and 27.3-31.2 mg% ascorbic acid. The mutant strains of currant-like tomatoes have a high degree of heterosis for the main characters of economic value.

Sh. I. IBRAGIMOV, doctor of agricultural sciences, and R. I. KOVAL'CHUK, candidate of agricultural sciences (All-Union Scientific Research Institute of Cotton Breeding and Cotton Seed Growing) dealt with development of methods for using induced mutagenesis in cotton plant breeding. Use of the method of acute irradiation of plants at different stages of ontogenesis yielded several promising mutant varieties of cotton, which are superior to commercial cultivar Tashkent 1 with respect to many economic and technological parameters. Mutant S-7503 was superior to it in boll size, length and yield of fiber, length of fracture [?], metric number and overall yield. In 1980, this mutant was handed over for State testing. The combination of remote hybridization and radiation-induced mutagenesis yielded a number of promising strains.

G. N. IMMAMALIYEV and M. A. MAMEDOV, candidates of agricultural sciences (Institute of Genetics and Breeding, Azerbaijan Academy of Sciences) used ionizing radiation in tea breeding. It is best to use close to critical doses for irradiation of tea seeds. Some promising forms were obtained with the use of different doses from the Azerbaijan 3 cultivar, and they are superior to the initial one with regard to the main morphological and economic characters. The absence of biochemical analysis of mutants makes it difficult to select forms for production tests.

Mutagenesis of fruit and berry crops was the topic of the paper of O. S. ZHUKOV (Central Genetic Laboratory imeni I. V. Michurin), candidate of agricultural sciences. Studies revealed that continuous irradiation of plants on a gamma field is a promising method for fruit and berries. The optimum cumulative doses of radiation for whole plants and their vegetative parts constitute 20-60 Gy. Some promising mutants of cherries and plums were obtained, which have compact height, as well as raspberries and blackberries with large fruit and high productivity, and mutants with improved biochemical composition of fruit. In the studies dealing with cherry breeding, pollen was exposed to γ-radiation in doses of 1-100 Gy. A method has been developed for treating plants with mutagens in a synthetic medium. This method permits irradiation and subsequent selection of mutant cells, tissues and entire plants under strictly controlled conditions, with due consideration of different environmental factors.

V. P. SEMAKIN, candidate of agricultural sciences (Orlov Zonal Fruit and Berry Station), discussed methodological problems of mutagenic breeding of apples. To induce mutations of the small type, cuttings were exposed to radiation twice, in a dosage of 30 Gy, with a 1-year interval between exposures. Forms were obtained that had increased resistance to scab. Attention was given to mutations with limited tree height, including forms of the "spur" [espalier?] type, which are necessary for intensive orchards. Selection thereof can be made according to meaningful characters, already in the nursery (shortened internodes, shorter runners, etc.). More than 700 specimens of small mutants have been accumulated, which were obtained from 15 varieties of apples. Most of them have small fruit and low productivity, the only exceptions being mutants of Zhigulevskoye apples, which combined limited plant height, short internodes of runners with normal size

and quality of fruit. In the opinion of V. P. Semakin, the proper choice of initial form is the decisive factor in mutagenesis. Promising initial forms for mutagenesis, as well as use in hybridization of mutants with valuable properties, are important at the final stages of the breeding process.

A. F. KOLESNIKOVA, doctor of agricultural sciences (Orlov Fruit and Berry Station) discussed advances in mutation breeding of cherries. Over a period of 20 years, she developed methods for inducing, procedures for early demonstration and identification of cherry mutants with retarded tree growth. It was demonstrated that there is a close link between length of internodes and height of trees at a young age, as well as at 2 and 5 years. Short radiomutants of cherries were used with success as insertion components to reduce the intensity of tree growth. It was found that phenotypic manifestation of mutations of retarded growth is due to low auxin content, which retards activity of the apical meristem. She succeeded in selecting some valuable base forms for breeding among the radiomutants.

A. S. RAVKIN, candidate of biological sciences, Prof Kh. K. YENIKEYEV and A. I. ANTOSHKINA discussed induced mutagenesis in currants and sea buckthorn. Experiments with currants revealed that chronic exposure to γ-radiation during plant vegetation, chronic irradiation during the period of bud differentiation in doses of 60-160 Gy, as well as acute irradiation of cuttings in doses of 20-30 Gy (0.65-4.9 Gy/h) were the most effective with regard to incidence of chlorophyll and morphological mutations. In the experiments with sea buckthorn, the highest incidence of the same types of mutations was obtained with chronic exposure to radiation during the vegetation period in a dosage of 9.6 Gy (0.42 Gy/h), chronic irradiation during the period of final growth--differentiation of buds (45-110 Gy; 4.2-12.4 R/h) and delivery of divided doses of radiation at the end of the vegetation period. Another procedure that increased the incidence of mutations was combined use of γ-radiation and physiologically active substances (β-indolyl butyric acid, benzyl aminopurine, phloridzin [glycoside], adenine and others). Use of critical and sublethal doses of radiation and these agents doubled the incidence of morphological and chlorophyll mutations. Trimming runners is also a procedure that increases the yield of somatic mutations of black currants. Trimming followed by vegetative reproduction is virtually the only procedure for changing unstable sectorial and mericlinal chimeras into relatively stable periclinal chimeras.

The paper of Ye. N. SAMOSHKIN (All-Union Scientific Research Institute for Use of Chemistry in Forestry), candidate of agricultural sciences, dealt with mutagenic breeding of trees. Use of chemical mutagens for treatment of seeds of the Scots pine, Norway spruce, pedunculate oak, European alder, red Ash and small-leaved lime elicited expression of various phenotypic and genotypic changes. It is recommended that mutagens be used only in stimulating and neutral doses.

Summing up the results of extensive discussion at the symposium, V. K. SHCHERBAKOV, chairman of the "Radiation Mutagenesis and Plant Breeding" section indicated that the main tasks under the 11th Five-Year Plan with regard to development of scientific research are as follows: studies of mutagenic activity and specificity of action of various physical and chemical factors, in order to use the most effective ones in breeding, role of genotype in mutational variability, determination of specificity of mutability in induced mutagenesis and parameters of variability in various agricultural crops, role of exogenous and endogenous modifying factors in mutagenesis and development of methods to monitor [control] mutagenesis, as well as mutations in evolution of cultivated plants, followed by crossing them

with cultivars to expand the stock of genes of cultivated plants; use of induced mutants to build a system of a species and apply mutagenic factors to solve special genetic and breeding problems--enhancement of genetic recombination, inducing chromosomal translocations, haploids, polyploids, aneuploids, to alleviate genetic transformation, obtain forms with male sterility and restorers of fertility; to overcome sex and somatic incompatibility; use in vitro experiments, etc.; develop the methodological bases of mutational breeding for different groups of plants: self-pollinating, cross-pollinating forms, plants reproducing vegetatively, parthenogenic specimens, polyploids, etc.; use of induced mutagenesis in breeding for higher level and improved quality of protein and other biologically and economically important compounds, immunity, change in appearance [habitus] and type of plant development, etc.; to develop and make a comprehensive study of the stock of mutant genes for breeding purposes, use in genetic and physiological studies.

The participants at the seminar adopted a decision concerning continued development of work in the area of plant mutagenesis. Publication of methodological recommendations on the use of mutagens in breeding grain, leguminous, vegetable crops and trees would expedite this work.

The "Radiation Mutagenesis and Plant Breeding" section of VASKhNIL recommends that the following principles, methods and variants of mutagenic treatment be used in breeding: various mutagenic factors (ionizing radiation, laser beams, chemical mutagens), which yields specific spectra of mutations; combined treatment with different mutagenic factors; preferred use of mutagen doses that do not depress growth and development of plants appreciably; involve as wide a diversity of cultivars as possible in mutagenic treatment; use mutagenic treatment on as much material as possible, bearing in mind the stochastic nature of mutagenesis.

F_1 hybrids should be treated with mutagens, since this increases the yield of mutations, intensifies gene recombination, makes it possible to overcome undesirable linkage of genes, etc.

New, highly effective methods should be used: treatment of stem meristem, leaving the root system intact; combining treatment with chemical mutagens and specific enzymes, which increase permeability of seed coats and other plant covers, as well as cell walls; use combined treatment with phytohormones (auxins, cytokinins) and mutagens; use mutagens to great synchronized cell populations; induce mutants in plants with altered hormonal metabolism.

One should use sensitizers or protective compounds in mutagenic treatment, depending on the objectives of breeding.

Meiotic cells and gametes should be submitted to mutagenic treatment. Such treatment should be performed at different ontogenetic stages. Irradiation of developing embryos should be used to increase the incidence of mutations. In this case, one succeeds in obtaining mutants, already in the first generation (changes in M_1 are rare when seeds are irradiated), and mutants should be selected already in the first generation that are homozygotic for specific genes; this also increases by 100-1000 times the yield of mutants, as compared to ordinary treatment methods; one can also obtain large amounts of twin plants at a rate that is 5000-10,000 higher than their natural occurrence.

One should treat the runners of plants that reproduce vegetatively with mutagens at the stage of beginning of formation of the flower tubercles. It is preferable to graft irradiated buds on rootstock (and not inoculate cuttings). In order to

obtain the largest number of mutations, one should induce runners from as many lateral primordia of growing points as possible; for this purpose one should cut of the heads of the grafts.

Mutagenic treatment of mutants should be repeated.

One should use induced mutagenesis for cultivation of wild relatives of cultivars, then use the induced mutants in crosses to expand the stock of genes for cultivars. Induced mutagenesis should be used for introduction and acclimatization of representatives of wild flora.

Mutagens should be used to overcome sex and vegetative incompatibility, alleviate genetic transformation and intensify genetic recombination.

One should make use of the correlation between radioresistance and productivity in developing new, highly productive varieties.

It was decided to convene the next session of this section in 1981, in Novosibirsk, at the Institute of Cytology and Genetics, SD USSR AS, Siberian Scientific Research Institute of Plant Growing and Breeding, SD VASKhNIL and Central Siberian Botanical Garden of SD USSR AS.

10,657
CSO: 1840/531

UDC: 632.952:633.1

RESOURCES FOR INCREASING GRAIN PRODUCTION

Moscow ZASHCHITA RASTENIY in Russian No 3, Mar 81 pp 26-27

[Article by Prof N. M. Golyshin, doctor of agricultural sciences, and V. I. Martynenko, deputy head of the Administration for the Protection of Plants of the Soyuzsel'khozkhimiya Association (All-Union Association for Use of Chemistry in Agriculture)]

[Text] Decontamination is an important element of an integrated system for protecting grain crops, and its objective is to destroy pathogens of fungal and bacterial diseases present on the surface of seeds, in the latter or in the sheath, as well as to protect seeds and shoots against soil phytopathogens at the early stages of development. Combined agents, which contain insecticide in addition to fungicides, protect plants at the early stages of development from soil pests when the number thereof is at a specific level.

Treatment protects wheat crops against wheat smut, barley against barley, wheat and stinking smut, millet against covered smut, oats against covered and oat smut, rice against alternariosis and pyriculariosis, and it also protects these crops against root rot (fusariosis, helminthosporiosis). Some products are effective against wheat and barley smut. In addition, treatment depresses mold fungi that strike seeds under adverse conditions (during the storage period, as well as after sowing) and seedlings; it attenuates the adverse consequences of traumatic damage to seeds, depressing development of deleterious microflora and activating defense reactions. The use of mercury-containing agents improves wintering of winter crops by depressing snow mold, which causes plant loss in the spring.

Treatment increases the vigor of seed sprouting by a mean of 14-25% and germination in the field by 11-18%, it stimulates growth and development of plants and augments the harvest by a mean of 15%. Not infrequently, there is restoration of germination of bread wheat [T. aestivum L.] 20-30% stricken with helmintosporiosis. With the use of granosan [seed fungicide] it is restored by up to 97-100% (I. M. Polyakov, 1971). Every ruble spent on treatment yields an average of 10 rubles of profit in the same year. Most effective is early treatment, several months prior to sowing; for this reason, farms that have not yet done this work must do so without losing a single day. Early treatment with granosan results in a high degree of decontamination of membranous [with hull or husk] crops. It must be borne in mind that only seeds with a high rating of all features are suitable for such treatment. If moisture content thereof exceeds 16%, long-term storage lowers germination. The grain must have somewhat lower moisture content (14%) for early treatment with wetting.

If the moisture content is higher (16%), treatment can be performed no earlier than 3 days before sowing.

All products, with the exception of formalin, can be used for early treatment. If seeds are treated with the latter more than 5 days before sowing, germination diminishes during storage. Treated grain cannot be kept in premises together with foodstuffs or fodder, even for a short time.

At several farms, seed treatment is still underestimated. For example, in Astrakhanskaya Oblast, only half the sowing material is treated. It is not by chance that, of all the tested barley there, 85% was stricken with smut. Organization of decontamination of sowing material leaves much to be desired in several oblasts of the Nonchernozem region. Thus, in the RSFSR, several dozen tons of seeds that did not meet the standards with regard to smut were planted in 1979, with particularly large amounts being used in Tambovskaya, Orlovskaya, Tul'skaya, Penzenskaya, Gor'kovskaya, Kirovskaya, Ryazanskaya oblasts and Mordovskaya ASSR. Year after year, Penzenskaya, Saratovskaya, Rostovskaya, Ryazanskaya, Ul'yanovskaya and Orlovskaya oblasts, Bashkirskaya ASSR and Tatarskaya ASSR have been delivering to the government large shipments of grain with smut content in excess of the permissible standards.

Although the trend toward increased development of smut in the fields of the Russian Federation had been already observed for a long time (1-5% invasion referable to 33,300 tons of grain in 1976, 115,700 tons in 1977 and 156,100 tons in 1978; the figures for combined infection with smut and "maran" [?] being 443,400, 301,500 and 1,200,000 tons), appropriate steps were not taken in many areas. As a result, a total of 75,000 tons of seeds that did not meet the standards for smut infection were planted in the RSFSR in 1980 (9100 tons in Penzenskaya Oblast, 7300 in Ryazanskaya Oblast, 6200 in Orlovskaya Oblast, 6100 in Kirovskaya Oblast, 5300 in Gor'kovskaya Oblast and 9600 tons in Mordovskaya ASSR). Large amounts of smut-stricken grain was delivered in recent years from farms in the Ukraine (Ternopol'skaya, Poltavskaya, Kirovogradskaya and Odesskaya oblasts), Kazakhstan and Latvia. Inspections revealed that many farms in the above oblasts and republics did not adhere to the proper technology for seed treatment, and there were instances of sowing untreated seeds. Thus, at the Rekonstruktor and Sovetskaya Rossiya sovkhozes in Aksayskiy Rayon, Rostovskaya Oblast, twice the required dosage of treatment agents was used. This is a gross infraction of technology. Poor use is being made of agent resources in Kostromskaya, Yaroslavskaya and Permskaya oblasts. There, only 30 to 50% of the planted seeds are treated. As a result, 33% of the grain crops are stricken with smut in Kostromskaya Oblast, 35% in Yaroslavskaya Oblast and 30-34% in Permskaya Oblast. Fusarium and Helminthosporium-Fusarium root rot have spread considerably, particularly in the steppe and forest-steppe regions of East Siberia, Altayskiy Kray, South Urals, Volgo-Vyatskiy Rayon, Kaluzhskaya and other oblasts, and Kazakhstan. The existing situation is indicative of the fact that inadequate attention is being paid to treatment, that there are gross infractions of the rules for treatment of seeds at a number of farms in the above-mentioned oblasts and republics. Many specialists and farm managers underestimate the harm of smut when development of the disease is at a low level, yet the latent losses in such cases constitute a relatively larger share than when there is intensive infection.

That the loss attributable to covered smut can be eliminated is indicated by the practice, not only in leading farms and rayons, but entire oblasts and even

republics: Lithuania, Estonia and Belorussia. For several years now, there has not been any covered smut infection of winter and spring wheat in Bashkiria.

Sometimes, the negligent attitude toward treatment is explained by the fact that this measure is not effective enough. However, a close examination of the situation reveals that regulations were not followed in all instances of poor decontamination: not all of the infected sowing material was treated, dosage was not adhered to (and when it is exceeded there is a decline in seed germination), holding time was not adhered to in the case of using formalin, the technique for treatment was not followed, there was unsatisfactory decontamination of containers and sowing machines, which caused re-infection of the seeds; cottage-craft types of equipment were used, or else spading was done manually (which is categorically forbidden), etc.

The large amounts of treatment agents for seeds that are left unused are also indicative of underestimation of this important measure by farms in many rayons. Thus, for the nation as a whole, they were rather high, about 14,600 tons per year in 1970-1972; however, they grew even more in 1973, reaching 22,800 tons in 1978. This was associated with increased residues of TMTD [tetramethylthiuram disulfide] and other mercury-free agents. In 1970-1972, the remaining amounts constituted a mean of 4500 tons per year, and increased even more in subsequent periods, constituting 17,700 tons in 1978, versus 6000 tons in 1973.

As of 1 January 1980, the supply of treatment agents at farms constituted about 61%. Of course, this is not enough, but the hourly load per machine dropped from 95 to 74 h in 1978, as compared to 1970, in the RSFSR, from 67 to 55 h in UkSSR and from 156 to 124 h in Kazakh SSR.

To reduce development of smut on grain crops and prevent loss of harvest from smut, it is imperative to intensify supervision of implementation of the set of measures to control these diseases. The supply of treatment machines, personnel protective gear at the farms must be checked, and steps must be taken for prompt delivery to kolkhozes and sovkhozes of needed materials and equipment. There must be proper overhaul and productive use of all available treatment machines--the PU-3, PSSh-3, RS-100F, PS-10, "Mobitox"--and two-shift work should be organized, forming mobile brigades for seed treatment when necessary. Specialized units should be set up at the farms, and instruction must be organized for them on safety practices; they must also undergo medical certification. An agronomist specializing in plant protection or the farm agronomist should supervise the work on seed treatment.

At the present time, we have the following agents available for treatment: hexathiuram for treatment of wheat seeds (2 kg/ton), granosan for wheat, barley, oats (1-2 kg/ton), millet (1 kg/ton), granosan with "tur" [?] for wheat and barley (1-2 kg/ton + 2.6-6 l/ton), mercuric benzene and mercuric hexane for wheat, barley, oats (1.5-2 kg/ton), millet (1 kg/ton), PKhNB [expansion unknown] for wheat and rye (2 kg/g), pentathiuram for wheat (1.5-2 kg/ton), TMTD for wheat (1.5-2 kg/ton), formalin for barley (0.2-0.25 kg/ton), oats and millet (0.38 l/ton), fundozol for barley, wheat, peas, soybeans and rice* (2-3 kg/ton), vitavaks for wheat (2.5-3 kg/ton) and barley (3-3.5 kg/ton).

*The agent is allowed for this crop only for experimental production use.

It is imperative to adhere to the following rule: severely injured seeds cannot be treated; treated grain must be kept in a cool, dry and aired place before sowing. Storage of treated sowing material in premises with high moisture or that are not equipped for this purpose results in mold invasion of the seeds and their loss. It should be borne in mind that the diminished germination observed in some cases does not reduce the economic effect of this procedure, since it is subsequently compensated by more intensive tillering of grain crops.

Farm managers must make use of this powerful reserve for increasing grain production in our country.

10,657
CSO: 1840/527

RELIABLE BARRIER LOSSES

Moscow ZASHCHITA RASTENIY in Russian No 3, Mar 81 pp 32-33

[Article by A. P. Stepanov, senior engineer of Glavelevatorprom (Main Administration for the Elevator Industry) of the USSR Ministry of Procurement]

[Text] Farm workers are faced with an important task, that of raising the mean annual gross grain harvest to 238-243 million tons in 1981-1985. Accordingly, there will be an increase in State grain resources and, consequently, even greater growth of the role of grain-receiving and grain-processing enterprises.

During the period of storage of State stock, prevention of grain loss due to pests acquires much importance. In the system of the USSR Ministry of Procurement, performance of this work is relegated to a specially established service for the protection of grain products. A total of 80 republic, kray, oblast and interoblast cost accounting expeditions were organized, which implement direct supervision of 228 detachments, 113 production districts and 4 brigades. In all, this service is manned by 2750 employees.

Each year, before the start of procurement of grain from the new harvest, all elevators, warehouses and other places where grain is stored, grain-processing enterprises, grain intended for public consumption, feed and seed use, and the territory around warehouses are submitted to extermination of insects and rats. The following is an illustration of the approximate extent of such work that is done each year: extermination of insects from grain warehouses totaling 86 million tons of capacity, decontamination of grain and products totaling 11 million tons, fumigation of premises constituting 141 million m^3, wet and wet-gas extermination of insects in premises constituting 60 million m^2, extermination of insects from territory near warehouses totaling 38 million m^2, aerosol spraying of premises with Gamma cartridges covering a volume of 33 million m^3, and extermination of rats over an area of 565 million m^2.

As a result of systematic performance of special measures, there has been some decline in recent years of grain infestation by weevils, lesser grain borers, mealworm beetles and grain beetles. There has been a reduction of infestation of grain storage buildings and grain-processing enterprises by Muridae.

Our enterprises have the appropriate insect exterminating equipment: special 4-AG units installed on motor vehicles, which are also designed for fumigation of grain products and premises; OMP-V sprayers that can be hitched to vehicles. RUP-2 units have started to be delivered for treatment of grain in a flow of organophosphorus agents.

Methyl bromide, product 242, methallyl chloride, dichloroethane, carbophos [malathion], DDVF [DDVP--hercol, o,o-dimethyl-2,2-dichlorovinyl phosphate], trichlorometaphos-3 [sodium metaphosphate] and KZMV [80% concentrate of green oil emulsion] are used to exterminate insects. The technology and methods of using chemicals are described in agency instructions, descriptions and other standard documents.

Fumigation of elevator with methyl bromide

In 1980, new instructions were put in effect for the control of grain stock pests, which were prepared with due consideration of the latest advances in science and technology, and progressive knowhow, as well as the requirements imposed by agencies of the USSR Ministry of Health for working with pesticides. These instructions include a new section, "Measures for the Prevention of Pest Infestation of Grain and Grain Products," which describes the main requirements for upkeep of granaries, warehouses with ready products, industrial premises, equipment and territory around enterprises. There was considerable revision of the section, "Chemical Measures for the Control of Pests," which is related to the larger assortment of agents that are allowed for use in insect extermination, introduction of new methods and techniques for decontaminating grain and granaries, and broader area of use of pesticides. The procedure for rating the quality of work dealing with chemical decontamination has been defined; methods are described for removing pesticide residue in grain and products of grain processing, as well as methods for analyzing residual levels of pesticides in grain products and in the air of production premises after chemical decontamination thereof.

In these instructions, particular attention is devoted to safety practices during extermination of insects and rats. In the section entitled "Measures for Public

and Personal Safety," new sanitation rules developed by the USSR Ministry of Health for storage, transportation and use of pesticides in agriculture are described, as well as rules for safety practices and industrial sanitation at enterprises, in organizations and institutions of the USSR Ministry of Procurement.

Work for the prevention and eradication of infestation of grain stock by pests must also be done in agricultural organizations. It is only with complex performance of preventive and protective measures, in both procurement and agricultural organizations, that we can achieve maximum efficacy thereof and reduce labor and material cost of this work.

At the same time, it must be noted that the necessary measures for the control of grain pests (extermination of insects before harvesting from new grain crop on all threshing floors and adjacent territories, grain-cleaning and grain-harvesting machines, infected grain of prior years' harvest, etc.) are not always implemented at kolkhozes and sovkhozes. There have been instances of delivery of pest-infested grain to grain-receiving and grain-processing enterprises in Krasnodarskiy Kray, Tambovskaya, Lipetskaya, Kaliningradskaya, Khersonskaya and a number of other oblasts.

The organizations that deal with protection of grain products render all the help they can to farms, as well as enterprises in the food industry, trade and consumers' cooperatives. Each year, work constituting a cost of 1.4 million rubles is done "on the outside." However, because of the shortage of production personnel and transport vehicles, it is impossible to fulfill all requests.

As the new five-year plan begins, the members of expeditions and detachments for the protection of grain products are planning steps to improve the efficacy of their work. The help of scientists is also needed by them. Methods and equipment for determining the extent of infestation of grain must be upgraded; there must be determination of the threshold of harmfulness of grain pests and economic expediency of using agents for extermination of insects, as well as development and introduction of new pesticides that would meet the higher specifications of sanitation agencies, development of new technological procedures and improvement of existing ones for chemical protection of grain and grain products, production and storage buildings of enterprises, with monitoring of extermination processes, which would reduce the outlay of pesticides and improve the quality of decontamination.

Development of new insect exterminating equipment that would be on a modern level, elaboration of methods and instruments for high-speed assays of fumigant levels in the air of premises that are decontaminated, refinement of methods of analyzing residual levels of pesticides in grains and products derived from processing it are important problems.

Still to be resolved is the problem of screening, training and retraining personnel for organizations dealing with protection of grain products, as well as some questions of economic and financial activities thereof.

Recently, a complex program for scientific research and experimental design work for 1981-1985 was developed and approved by the USSR Ministry of Procurement, dealing with the scientific technological problem of "Protection of Grain and Grain Products Against Grain Stock Pests." Implementation of the main tasks in

this complex program will aid in achieving optimum and effective use of chemical pesticides, as well as in increasing labor productivity related to insect and rat extermination, improving working conditions, reducing grain, grain-processing product and environmental contamination by the pesticides.

10,657
CSO: 1840/527

UDC: 632.118.3

NATURALLY OCCURRING HEAVY RADIONUCLIDES IN AGRICULTURAL PRODUCTION

Moscow VESTNIK SEL'SKOKHOZYAYSTVENNOY NAUKI in Russian No 3, Mar 81 pp 136-138

[Article* by V. A. Yegorova, candidate of biological sciences]

[Text] The plenum and conference were convened by the All-Union Scientific Research Institute of Agricultural Radiology, USSR Ministry of Agriculture, and Central Institute for Agrochemical Servicing of Agriculture.

As a result of intensive endeavors of man in the last decades, an enormous amount of ore and minerals are being extracted to the earth's surface, which contain heavy natural radionuclides (NRN). Recovery of phosphates and subsequent use of phosphorus fertilizers containing NRN on farmed land is one of the routes by which additional amounts of NRN penetrate into the biosphere. There has been little study of the migration capacity of NRN in different situations; the data in the literature are quite limited, and they were obtained under different conditions with the use of different methods for identifying NRN, for which reason the urgency of discussing this matter is unquestionable.

The paper of A. P. POVALYAYEV, R. M. ALEKSAKHIN and Ye. V. YUDINTSEVA dealt with the principles of approaches to the problem of setting standards for levels of heavy NRN in mineral fertilizers. It discussed the quantitative parameters characterizing the extent of addition of heavy NRN with fertilizers, concentration of these radionuclides in soil and passage of radiologically significant NRN into plants. Absorption of heavy NRN by agricultural plants may vary by 100 or more times, depending on the biological distinctions of plants and physicochemical properties of the soil. One of the main tasks for agricultural radiology is to obtain base experimental data on levels of the main heavy NRN in the principal agricultural crops for the most widespread types of soil.

Some interesting experimental material was discussed in the papers of staff members of the TsINAO [expansion unknown] and its branches. L. V. NIKOLAYEV, M. Ye. KONOVALOVA, S. I. NEDYALKOV and A. I. AKHTYAMOV submitted data on levels of ^{226}Ra and ^{228}Th in phosphorus fertilizers of different origin. Minimal concentrations of

*Joint plenum of the Council for Agricultural Radiology under the Presidium of the All-Union Academy of Agricultural Sciences imeni Lenin, Radioecology Section of the Scientific Council for Problems of Radiobiology, USSR Academy of Sciences, and Conference on "Problems of Migration of Heavy Naturally Occurring Radionuclides in the Fertilizer-Soil-Plant System," Moscow, 2-4 April, 1980.

^{226}Ra were found in apatites of the Kola Peninsula ($2.6 \cdot 10^{-4}$% U) and maximum levels in phosphate fertilizer [phosphorite flour] from the Verkhnekamskiy and Kingiseppskiy deposits. There was a 5-fold increase in concentration of uranium in the course of technological processing of apatites, while the concentration of thorium diminished. The maximum concentration of ^{226}Ra in soil constituted 0.87 pCi/g. Migration of natural radionuclides into plants as related to use of phosphorus fertilizers in doses of 160 to 450 kg/ha [hectare] was estimated by M. Ye. KONOVALOVA, O. I. LOKALINA, I. G. PAKINA and N. L. ODAYEVA. Migration of thorium into the vegetative mass of corn increased from $1.9 \cdot 10^{-6}$% to $2.9 \cdot 10^{-6}$%. Migration of Ra and Th into the vegetative mass of the cotton plant reached $1.2 \cdot 10^{-4}$% to $7.2 \cdot 10^{-4}$%. With the use of phosphorus fertilizers, the coefficient of accumulation of Ra in plants constituted $2\text{-}5 \cdot 10^{-3}$ for corn, $6\text{-}18 \cdot 10^{-3}$ for alfalfa and $2\text{-}6 \cdot 10^{-1}$ for cotton; the coefficient of accumulation of Th constituted $1\text{-}2 \cdot 10^{-3}$, $2\text{-}6 \cdot 10^{-3}$ and $1\text{-}5 \cdot 10^{-1}$, respectively.

Some authors discussed migration of NRN into different crops from different soils. In the paper of B. M. KAVTELADZE, V. S. MGELADZE and A. M. KALANDARISHVILI, which dealt with the effects of phosphoric fertilizers on accumulation of uranium, radium and thorium in herbaceous plants, **a direct correlation was established between the amount of phosphoric fertilizer applied to soil and levels of Ra and Th in plants. Such a function is not observed for U, which is apparently attributable to the fact that a certain physiological barrier, related to the high biological toxicity of U,** appears with uptake of U. Maximum build-up factor was noted for Ra, absorption of which is 10 times higher than U and 100 times higher than Th.

The effect of long-term use of fertilizers on accumulation of U in some agricultural plants, the behavior of thorium from technogenic waste in soil and migration thereof into plants were discussed by A. S. SULTANBAYEV, A. I. KADYROVA and T. M. AYTBAYEV (Kirghiz Scientific Research Institute of Agriculture). Long-term use of mineral fertilizers and manure had no appreciable effect on overall U content of soil. Use of peat more than doubled the amount of nuclide in the top soil. With regular use of mineral fertilizers, particularly those with nitrogen, the mobility of uranium compounds in soil increases by 1.5-2 times. In sugar beet plants raised on soil fertilized with NPK, 2.9 times more U migrated into the tops in the case of ordinary gray desert soil [serozem] and 1.7 times more with meadow-serozem soil than with unfertilized soil, the figures being 1.3 and 1.7 times more for the root crop. With the use of organic fertilizers, migration of U diminished to the above-ground part of sugar beet plants and increased to the root crop. U from soil fertilized with NPK migrated into winter wheat plants in 1.4 times greater amounts for the straw and 1.3 times more for the roots than in unfertilized soil, the figures for potatoes being 1.5 times more for tops and 3 times more for the tubers. Use in soil of technogenic waste containing Th increased migration thereof into plants. The concentration of Th in vegetative organs of wheat was 1.6 times higher with the use of technogenic waste. Combined use of NPK and manure increased by 1.8 times removal of Th with the harvest.

E. B. TYURYUKANOVA (Institute of Geological and Analytical Chemistry imeni V. I. Vernadskiy, USSR Academy of Sciences) reported on the background levels of Th in the soil and vegetation mantle of wooded areas and differences in Th content of different soils (a mean of 2 to 7 mg/kg, with possible fluctuations from 0.2 to 9.5 mg/kg). The concentration of Th in the forest floor and vegetation did not exceed 0.2 mg/kg dry substance, which is indicative of minimal involvement of Th in biological chains of natural biogeocenoses.

V. L. ANANYAN and A. Sh. AVETISYAN observed that migration of Ra into plants on hay meadows of the meadow-steppe zone diminishes with the use of fertilizers, as a result of dilution of biomass in the course of increasing the harvest. In vegetation experiments with alfalfa grown on brown carbonate soil, there was an increase in Ra concentration in plants in the variants with fertilizers.

The papers of V. F. DRICHKO and E. P. LISACHENKO, and others (Institute of Radiation Hygiene) dealt with passage of ^{226}Ra and ^{228}Th into top soil with phosphoric fertilizers, and the patterns of NRN behavior in the soil-plant system. The total amount of NRN of the uranium and thorium series recovered with phosphates is estimated at 78 Ci/year for ^{228}Th and 298 Ci/year for ^{226}Ra; up to 25% thereof goes into top soil with phosphoric fertilizers. The influx of heavy NRN into soil varies in different parts of our country from 100 to 1500 nCi/ha/year, depending on the amount and types of fertilizers. It was observed that migration of NRN from soil into agricultural plants is governed by the behavior patterns inherent in all chemical elements in the soil-plant system: the build-up factor for ^{226}Ra and ^{232}Th is unrelated to concentration in soil; there is a linear functional correlation between concentrations of radionuclides in successively connected links of the migration chain; uptake of heavy NRN in the course of migration is related to uptake of analogue elements; the build-up factor depends on the form in which NRN is put in the soil.

The paper of E. I. ASHKINAZI concerning the patterns of migration of ^{226}Ra and ^{228}Th submitted data showing that the concentration of exchange ^{226}Ra is 2-3 times higher in soddy podzolic soil than in chernozem soil, while the concentration of ^{226}Ra in plants on chernozem soil was 2-20 times lower than in plants on podzolized and soddy podzolic soil.

N. P. ARKHIPOV, L. T. FEVRALEVA and G. N. ROMANOV discussed the patterns of migration of ^{238}U, ^{226}Ra, ^{232}Th, ^{210}Po and ^{210}Pb from fertilizers into agricultural plants. On the basis of data obtained from experiments with various cultivated crops (barley, corn, wheat, potatoes), it was established that 100 times more NRN is accumulated in plant roots than their top parts. The productive organs of plants take up an average of 2-3 times less NRN than the vegetative part. Different agrochemical properties of soil do not have an appreciable effect on migration into barley of U and Th. An inverse correlation was demonstrated between concentration of Ra in vegetative parts of barley and level of exchange Ca in soil, humus, absorption capacity of soil and pH of soil solution. Plants assimilated the most readily water-soluble forms of ^{226}Ra, ^{210}Po and ^{210}Pb. The paper, in which N. P. ARKHIPOV, Ye. A. FEDOROV, L. T. FEVRALEVA and T. A. FEDOROVA participated, dealt with forecasting of accumulation of NRN in soil with regular use of phosphoric fertilizers. The periods of establishment of equilibrium between input and output of NRN from the top soil and maximum increment in levels thereof in an equilibrated state were calculated by means of an exponential model of accumulation of NRN in soil with regular use of fertilizers, on the basis of experimental data. The accumulation factors for NRN by plants are low, in the range of 10^{-4}-10^{-6}, with a maximum of about 10^{-1}.

K. P. MAKHON'KO and F. A. RABOTNOVA (Institute of Experimental Meteorology) delivered some rather interesting papers on the distinctive features of extraroot contamination of plants by heavy NRN on different types of soil in the USSR. In this case, NRN do not travel over the root system and enter into the top parts of plants from dust particles, mechanically contaminating plant surfaces. An

equation was proposed to calculate the amount of NRN migrating by the aerosol route into agricultural products over the vegetation period. The paper of K. P. MAKHON'KO concerning the use of parameters of impurities carried by the wind from the soil surface for determination of aerosol contamination of plants by NRN investigated the process of wind-borne radioactive dust on the natural herbaceous mantle of the Nonchernozem Zone of the USSR in the summer months. The coefficient of migration of Th, U and Ra into grass referable to nonroot penetration is defined as the coefficient of migration as related to concentration of radionuclides in raised dust and concentration thereof in grass. The amount of fertilizer used on the field, depth of plowing it in, background concentration of these radionuclides in soil, duration of vegetation period and herbage yield are taken into consideration.

Much attention was given to one of the most important problems in the study of behavioral distinctions of NRN in agrocenoses, i.e., methods of assaying NRN concentration in biological objects, ore and fertilizers.

The paper of T. M. PONIKAROVA discussed radiochemical methods of assaying heavy NRN. New modifications for isolating U and Th from soil, minerals and plants were proposed in the paper of I. I. SHUKTOMOVA (Institute of Biology, Komi Branch of the USSR Academy of Sciences). The methodological distinctions of gamma spectrometric assays of heavy NRN in fertilizers, soil and plants were discussed in the paper of E. P. LISACHENKO, A. N. SILANT'YEV and I. G. SHUKSHONOVA (Institute of Experimental Meteorology) used the gamma spectrometry method to assay NRN in field studies, directly at the site of determination of NRN concentrations. The detector used in these studies is suitable both for taking readings on the soil surface and at different depths. A micromonolithic method was proposed for taking soil samples in order to determine the NRN concentration in a specific layer of soil.

Yu. V. ALEKSEYEV and N. I. VYALUSHKINA reported on assaying U and Ra in plant ash from one batch. In order to make such assays, a batch of ash corresponding to 1 kg raw potato or root crop, 100-200 g hay or dry haulm are needed. U was determined by the fluorescence method in NaF beads, and Ra by the emanation method. Use of hard track detectors was recommended by M. Ye. KONOVALOVA and V. S. VASIL'YEVA for assaying ^{235}U in plant ash. A dacron [lavsan] film, 20 μm in thickness, was used as a detector. The plant ash weighed 20 mg, and layer thickness was 50 μm. It was exposed to an integral flux of thermal neutrons in a dosage of $3\text{-}5\cdot10^{-16}$ n/cm^2. The distinctions of methods for assaying concentrations of heavy NRN evoked broad discussion among the conference participants.

It was proposed that a complex program of research dealing with evaluation of the patterns of migration of heavy NRN into agricultural plants, evaluation of the patterns of migration of NRN from soil into farm plants as a function of soil properties and biological distinctions of plants be developed in order to solve the problem of setting standards for levels of heavy NRN in phosphoric fertilizers, as well as in view of the increasing radiological significance of this problem in the light of intensifying the use of chemistry in agriculture. This would yield data needed for setting standards for levels of heavy NRN. It is necessary to determine the concentrations of NRN in all types of phosphoric fertilizers, with due consideration of the diversity of the phosphate raw material, as well as to develop and implement a program of research to evaluate the forms of NRN that are biologically the most significant in soil and fertilizers in order to define the quantitative parameters for more accurate estimation of migration of heavy NRN from different types of soil into different agricultural plants.

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CSO: 1840/531

SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

STATUS AND PROSPECTS OF DEVELOPMENT OF THE BIOLOGICAL METHOD

Moscow ZASHCHITA RASTENIY in Russian No 3, Mar 81 pp 15-19

[Editorial]

[Text] The above was the title of the All-Union conference that convened in November of last year in Kirovabad. About 200 people from all Union republics participated in its work--scientists, production people, instructors at agricultural VUZ's and representatives of Sel'khozkhimiya [Main Administration for Use of Chemicals in Agriculture].

It is not by chance that Azerbaijan was chosen for the All-Union forum on the biological method. Recently, some interesting knowhow has been accumulated there in biological protection of a number of cultivated crops. The use of insecticides is alternated with treatment with microbiological agents, use of parasites and predators of pests.

Yet, very recently, this republic was criticized with justification for its excessive enthusiasm for chemical protection. Some correct conclusions were derived. There was improvement in organization of work; the positions of agronomer-entomologists were added at each farm; criteria were developed for the use of chemical agents. While treatment of cotton plants with pesticides was performed an average of 11.5 times in 1975, 8.7 times in 1978 and 5.1 times in 1979, this was done only 3.1 times in 1980. This reduction occurred in spite of the increase in area planted with cotton from 220,000 to 248,000 ha [hectares]. In 1980, a record crop of cotton was harvested in this republic.

The conference was convened by M. S. Mamedov, candidate of agricultural sciences, laureate of the State Prize of this republic and chairman of the Azsel'khozkhimiya Association [Azerbaijan Association for Use of Chemicals in Agriculture]. He told about the achievements of farm workers in Azerbaijan with regard to augmenting agricultural production, and their fulfillment of socialist obligations before the target date. Thus, gross agricultural output in this republic under the years of the 10th Five-Year Plan was greater than the production in the 7th and 8th five-year plans together. The average yearly growth in agricultural production in the 10th Five-Year Plan increased by 46% as compared to the 9th Five-Year Plan. As compared to the latter, the nation received 1.5 times more grain, cotton, potatoes and tea, 2.1 times more grapes, 67% more fruit, 57% more vegetables, etc., under the 10th Five-Year Plan. The targets for the 10th Five-Year Plan were reached ahead of time in industrial and agricultural production. Comrade L. I. Brezhnev congratulated warmly the workers of this republic.

While Azerbaijan produced 299,000 tons of cotton (15.2 q/ha harvest) in 1969, the figure almost tripled in 1980, constituting more than 880,000 tons (from 35 q/ha) in 1980. No other Union republic achieved such a rate of development of cotton growing. Azerbaijan has advanced to first place in our nation in the production of grapes (1,460,000 tons).

The workers of Sel'khozkhimiya made a great contribution to the achievements of farmers. There was extensive introduction of integrated methods for protecting the main crops against pests and diseases, particularly in the cotton fields.

Some success has been achieved in using the biological method. Under the 10th Five-Year Plan alone, four mechanized biological laboratories were built in the main cotton-growing regions, and construction is being completed on an eight-line biological plant. In the next few years, nine more mechanized biolaboratories will start operating. While the biological method for the control of the bollworm was used on 133,700 ha in 1979, in 1980 the area increased to 154,000 ha.

M. S. Mamedov told also about the difficulties that are hampering further development of the biological method in this republic: inadequate methodological guidance on the part of scientific research institutions, poor work on detecting local forms of useful entomophages, lack of an overhaul [repair] base, which does not permit operation of the biolaboratory to full capacity, as well as mechanization of dissemination of Trichogrammatidae and inadequate training of personnel. Azsel'khozkhimiya is taking steps to eliminate these flaws, but it should be helped to strengthen the material and technical base of the biolaboratories.

The following delivered papers at the conference: I. A. Churayev ("Status and Prospects of Development of Plant Protection in the Nation"), deputy chairman of the Soyuzsel'khozkhimia Association and head of the Administration for Protection of Plants; V. A. Lebedev ("Tasks and Work of the East Palearctic Section of the International Organization for Biological Control of Harmful Animals and Plants"), head of the State Inspectorate for Quarantining Plants, USSR Ministry of Agriculture, and general secretary of VPS MOBB [East Palearctic Section of International Organization for Biological Control of Harmful Animals and Plants]; K. Ye. Voronin, ("Status of Research on Limiting the Use of Chemical Agents for Plant Protection on the Basis of Consideration and Forecasting the Activity of Natural Entomophages"), deputy director of VIZR [All-Union Institute of Plant Protection]; A. M. Grinberg ("Development of Scientific Research in the Field of Biological Methods and Prospects of Using Trichogrammatidae"), deputy director of VNIIBMZR [All-Union Scientific Research Institute of Biological Methods for Protection of Plants]; N. V. Bondarenko ("Biological Method in Open Ground"), corresponding member of the All-Union Academy of Agricultural Sciences imeni Lenin; A. T. Ushchekov ("The Biological Method in Closed Ground"), senior scientist at VNIIF [All-Union Scientific Research Institute of Phytopathology]; S. R. Mamedova ("Distinctions in Use of Biological Agents in Azerbaijan"), director of AzNIIZR [Azerbaijan Scientific Research Institute for Protection of Plants]; T. A. Shekhurin ("Means of Increasing Efficacy of Microbiological Agents"), head of the Microbiological Method Laboratory at VIZR; Yu. B. Shurovenkov ("Results of Work on the Biological Method to Be Used in Production")- director of VNIIZR [All-Union Scientific Research Institute for Protection of Plants]; Z. A. Ragimov ("Integrated Protection of Cotton Plants Against Pests in Azerbaijan"), director of AzNIKhI [Azerbaijan Scientific Research Institute of Cotton Growing]; A. I. Smetnik ("Use of Pheromones in Quarantine Practice and Protection of Plants"), director of VNITIKiZR [All-Union Scientific Research Institute of ... (expansion unknown) ... and Protection of Plants]; G. I. Kogan

("Experience in Raising the Codling Moth"), director of the Odessa Branch of the Agropribor [agricultural instruments] Association. There were also speeches by representatives of republic-level administrations for protection of plants: V. P. Pilatov--RSFSR, O. V. Shilina--UkSSR; T. F. Abbasov--AzSSR, B. Tuleganov--UzSSR, and others.

As we know, the Soviet Union is a member of the International Organization for Biological Control (MOBB), which has eight regional sections. More than 100 countries are members of this organization. The East Palearctic Section (VPS) is headed by Yu. N. Fadeyev, academician of VASKhNIL [All-Union Academy of Agricultural Sciences imeni Lenin]. It is comprised of 10 countries (Bulgaria, Hungary, Poland, USSR, Czechoslovakia and others). There are five permanent commissions working fruitfully in the section which deal with entomophages and phytophages, microbiological agents, integrated systems, genetic methods and editing and publishing. A special information bulletin is published (four times a year); extensive exchange of biological agents and needed information has been organized; joint work is being done on methods for industrial breeding of useful insects, ticks and microorganisms; a catalogue of strains has been compiled (from the data of 31 scientific research institutions); the technical specifications for microbiological agents have been defined, as well as principles for using sex pheromones, and others.

In the last few years, increasing attention is being given to development of integrated systems for protection of plants, which involve the use primarily of nonchemical agents, strictly selective and safe use of pesticides. In these systems, an important place is reserved for the biological method. The task has been formulated of reducing the frequency of chemical treatment, reduction of the deleterious effects of such treatment on the environment, and creating the proper conditions for development of useful organisms.

The biological method has a great future under conditions of intensification and specialization of agricultural production. The concentration of plantings and limited set of crops will help create beneficial conditions for development of epizootic outbreaks among harmful insects.

The concept of the biological method includes the use of entomophages, microbiological agents and preservation of useful entomofauna. While biological agents were used in open soil over 5.2 million ha and in closed soil over 1.1 million m^2 in 1971, when useful entomofauna was preserved over 0.2 million ha, the figures were 10.7, 10.0 and 1.7 million, respectively, for 1975; 13.9, 20.0 and 5.0 million in 1977, and 15.3, 34.0 and 6.5 million ha in 1980 (according to preliminary data). Considering the regulatory role of natural populations of entomophages, at present biological protection of plants constitutes about 25% of the work done to control pests and diseases.

In the RSFSR, the biomethod was used last year over 9 million ha, and there are plans to use it on 13 million ha. There are 56 oblast, kray and republic-level biological laboratories, 70 kolkhoz, sovkhoz and interfarm laboratories in operation at the present. There is a production-scientific council for the biological method under the Administration for Protection of Plants. Trichogrammatidae are used in the RSFSR over 2.2 million ha annually. This indicator could be doubled if processes of breeding and using them are refined.

In the Ukraine, there are already 16 biological factories and about 300 biological laboratories in operation. There, much attention is given to training personnel, and a standard statute has been worked out for interfarm biological laboratories.

In Azerbaijan, special councils for plant protection have been established in each rayon. They give concrete assistance to farms with regard to the use of chemical and biological agents. Following the example of Tajikistan, competent inspectors have been assigned there for every 150-200 ha cotton.

In Uzbekistan, a special administration for the biological method was organized in the system of Uzsel'khozkhimia [Uzbek Association (or administration) for Use of Chemistry in Agriculture], and there are more than 220 biological laboratories. Last year, biologicals were used on 1.4 million ha, including Trichogrammatidae on 300,000 ha. While entomophages were used over 210,000 ha in 1979, the figure for 1980 was 500,000 ha. Production of mechanized lines for breeding Trichogrammatidae has been organized. The staff of each oblast station includes a chief and senior agronomists for the biological method, and at every rayon station there is a senior agronomist; there are continuous courses on the biological method.

In that republic, there are now 35 mechanized lines for the production of Trichogrammatidae; soon this figure will rise to 500, and the egg parasite will be released over an area of 3.4 million ha. While "khabrobrakon" [?] was used on 57,600 ha in 1979, the figure was already 70,600 ha in 1980. The use of biological agents is also increasing (from 700,000 ha in 1979 to 918,000 ha in 1980). Integrated protection of the cotton plant is being used with success at the Politotdel, imeni Sverdlov, imeni Kirov, Fergana, Leningrad kolkhozes and other farms in this republic.

The knowhow of Uzbekistan indicates that one can successfully control the bollweevil without using chemicals, with the use of the biomethod--Trichogrammatidae or khabrobrakon and dendrobacillin.

Azerbaijan has also set a firm course toward expansion of the use of biological agents. For example, while Trichogrammatidae were released over 15,700 ha in 1978, the figures were 34,100 ha in 1979 and 55,100 ha in 1980; microbiological agents were used on 148,000 ha. Last year, chemical treatment of cotton plants was eliminated at the Geleba and imeni Gadzhiev kolkhozes, Agdzhabedinskiy Rayon, on 7650 ha, on 7500 ha at the Moscow Kolkhoz in Zhdanovskiy Rayon and on 14,800 ha at the Communism Kolkhoz in Bardinskiy Rayon. The role of the biological method and useful insects was evident.

In the Soviet Union, there are 35 scientific research and other institutions of 25 ministries and agencies working on the biomethod. Their work is coordinated by a problem council, manned by prominent scientists of our country. The main directions of research are as follows: development and refinement of principles for use of entomophages and entomopathogens in the conditions of intensive agriculture; improvement of efficacy of local populations of entomophages and entomopathogens; determination of their efficacy; expansion of introduction and acclimatization of insects and pathogens; development of methods for industrial breeding, storage and mechanized breeding of useful organisms.

The search is continuing for effective biological agents; work is being done to enhance the quality and refine the technology of using the biological agents that

are being produced at the present time. Research is developing in the area of identification, synthesis, development of methods of using agents with new type of action, such as pheromones, hormones, repellents, chemical sterilizing agents, etc.

Considerable research on biological protection of plants is being conducted at the VNIIZR. The scientists in this institute are not only studying the means of continued development of the biomethod, searching for new procedures and agents, refining the methods and technology of using biological agents, but in each specific instance they are giving clearcut recommendations to the industry.

All of the work in this field is governed by the same goal, that of reducing the use of pesticides without detriment to harvest or the environment.

Scientists have introduced into agricultural production the TsChR [expansion unknown] method of early prediction of useful function of egg parasites of Erygaster integriceps stinkbugs to reduce chemical control measures. A comprehensive study was made of the species composition, biology and ecology of golden eyes [Chrysopidae] and ladybirds [Coccinellidae], which made it possible to recommend a system of measures to preserve them during chemical treatment, and accumulation in agrobiocenoses.

The role of entomophages (in the aspect of species) and pathogens was demonstrated with regard to reducing the population of webworms [Loxostege sticticalis (L.)]. Thus, in sites of mass reproduction, use of the parasites resulted in destruction of 11-50% of the pests, use of microorganisms destroyed 10-30% and, in a number of instances, Trichogrammatidae infected up to 45% of the webworm eggs. Species and forms of Trichogrammatidae confined to the webworm were selected, and standards and time of releasing them were established. The institute's scientists have proven that it is possible to seed Trichogrammatidae on planted fields by applying infected sitotroga [?] eggs in the form of an aqueous suspension; a design was developed and successfully tested for mechanized dissemination of Trichogrammatidae. The technical effectiveness of Trichogrammatidae in production experiments against the cabbage moth and small white butterfly [Pontia rapae L.] constituted over 93%.

For several years, the scientists of the AzNIIZR studied the effects of microbiological agents produced on the basis of pathogenic bacteria, fungi and viruses. Thus, production testing of technical efficacy of bitoxibacillin (3-fold treatment) showed it to exceed 75%, and there was a net income of 627 rubles/ha. It was also found that this agent has acaricidal properties. Extensive studies were conducted on penetration, distribution and preservation of antibiotic substances of antagonist microorganisms in various organs of the cotton plant after administration thereof through the root system and on the leaf surface. Analogues of juvenile hormones and synthetic pheromones of the bollweevil, codling moth and European grape moth have been tested.

At the AzNIKhI, extensive work is also being done for preservation of useful and predatory insects. The integrated system for protection of the cotton plant is also being refined. It includes increasingly effective atrotechnical procedures, which make it possible to reduce the number of pests. Thus, cotton plant pinching made it possible to eliminate one pesticide treatment during the period of mass scale egg-laying and extinction of caterpillars of second-generation bollweevils.

A differentiated approach is being used to setting standards for use of chemicals: less use recommended until the cotton plant rows connect, more use after they connect; the optimum dosage of pesticides has been established for each zone. A series of production tests was conducted, which demonstrated that it is possible to protect the cotton plant successfully using only biological agents.

In our country, Trichogrammatidae are the most used useful insects (11.2 million ha) for grain, commercial, vegetable and fruit crops. In the near future, its use will increase by 1.5-2 times by means of expansion of areas in Central Asia, Kazakhstan, the Far East and other regions. Some advances have been made, but there are still many unresolved problems, and a high efficacy is not always obtained. This is attributable to failure to adhere to the methods of mass scale breeding, inadequate equipment at the biolaboratories, poor training of personnel and insignificant amount of scientific research on Trichogrammatidae.

There are plans to develop synthetic food substrates for industrial breeding of egg parasites. It is also important for the parasite form that is being raised to conform with the distinctions of a particular zone (use of mathematical models of its quality as a function of meteorological conditions).

More attention should be given to questions of genetics and breeding of Trichogrammatidae, development of effective methods of evaluating the quality and standards for Trichogrammatidae, refinement of technology of use thereof. There is still much vagueness in the standards, frequency and sites of releasing them with due consideration of the crop to be protected, density of pest egg laying and climate conditions during the period of migration. The methods of keeping records of technical and economic effectiveness of Trichogrammatidae must be perfected; it is imperative to increase the productivity of biological factories, reduce production cost by means of better organization of work processes and labor. We should organize a special enterprise for the production of technical agents for biological protection of plants, with a planning and design bureau and experimental farm (many participants at the conference discussed this).

At the present time, there are more than 650 biolaboratories and biofactories engaged in raising and using Trichogrammatidae. Unfortunately, many of the biolaboratories are not specialized primarily in Trichogrammatidae production. We must become more active (on the example of Uzbekistan) in switching to the breeding of khabrobrakon, golden eyes, pseudaphycus, chalcid parasites, allotropes, phytomis [phytomonas?], microbiological agents, the predatory fungus aschersonia, and others.

Some positive results have already been obtained in many parts of our country with the use of such useful insects as predatory gall midges, hover flies [Syrphidae], golden eyes, aphids and encarsia for the control of the white fly, aleokhar [?] and tribliograph (with cabbage flies) and others.

One of the main problems in the biomethod is referable to scientifically substantiated criteria for proportion of the main entomophages and pests (with due consideration of weather conditions, season, condition and development of plants, level of agrotechnology, varietal distinctions, planned harvest, etc.), with which one can rule out or drastically reduce chemical treatment. Unfortunately, our scientific institutions dealing with protection of plants are very slow in solving this problem. Work on this problem is being done better in Tajikistan

than elsewhere. The knowhow of that republic has been discussed many times already in this journal, with regard to use of an integrated system for protection of cotton plants, which is based on strict consideration of development of harmful and useful species, and criteria for number thereof. There, chemical treatment is used only after each field has been exhaustively inspected, and it is reduced to a minimum. The CC of the Tajik Communist Party has approved of their work, and it was also praised at the All-Union seminar-conference of employees of Sel'khozkhimia; it has been recommended for broad introduction.

Of the entomophages against pests, the following are used: chalcid parasites of the woolly apple aphid [American blight], pseudaphycus and allotrope against the Comstock mealybug, cryptolemus, coccophagus in the control of Coccidae and Diaspididae [armored scale].

The biomethod is being actively introduced in protected ground. Special mention should be made of the wide use of the predatory tick, phytoseilus. Use thereof more than doubled, as compared to 1975, and constituted 22.5 million m^2 in 1980, while the entire biological method was used over 36 million m^2 of protected soil.

Work is progressing well in the area of including phytoseilus in integrated systems for the protection of vegetable crops in protected soil. Much attention is being devoted to breeding phytoseilus for resistance to pesticides and high temperatures. It is possible to broaden the scope of its use and increase its efficacy by organizing specialized biological laboratories.

With each passing year, more and more attention is being given to preservation of useful entomophages in agrocenoses. As a result, chemical treatment is being eliminated over significant areas where grain, technical, vegetable and fruit crops are being raised, as well as perennial grass. It is imperative to provide more distinct regulations on the use of pesticides for this work to proceed more successfully. The standards for use of pesticides must be set at the gram level, with due consideration of development of harmful and useful species, and condition of plants. The same should be stated about the time of chemical treatment.

Most parasites and predators, pathogens of pest diseases, have been studied very little thus far. This prevents us from predicting their development and controlling useful activity.

Quite a lot was said at the conference about the role of microbiological agents. The scope of use thereof presently constitutes more than 4 million ha. Widest use is being made of bactorhodencid, dendrobacillin, bitoxibacillin. Continued introduction of the microbiological method is being hampered by a number of causes. There is a very limited assortment of agents; of the 21 recommended by the industry only 3 are being produced (dendrobacillin, BIP, bitoxibacillin), and all of them are derived from bacteria of the Bacillus thuringiensis group. Trichotecin and phytobacteriomycin against the pathogens of plant diseases are not being produced.

The quality of biological agents is not meeting current specifications because of infractions of regulations for their production or unfinalized technology. These agents are very expensive and their shelf life is short. All this compels the biolaboratories to work on the production of microbiological agents under semi-cottage industry conditions, and of course this also does not guarantee their

quality. Justifiable claims have long since been made by production people to Glavmikrobioprom, but they are slow in solving these problems. It is imperative to intensify quality control for the biological agents being delivered by Sel'khozkhimiya.

At the present time, viral agents are undergoing a successful trial for the control of the bollworm, codling moth, American white butterfly, cabbage moth, lackey moth [Malacosoma neustria (L.)] and other pests. However, industry has not yet mastered the technology for production thereof.

It is planned to intensify research on isolating from natural populations the harmful organisms, identifying and selecting highly virulent strains of bacteria, fungi, protozoans, nematodes and viruses, as well as development of methods of synthesizing highly virulent strains, laboratory and experimental-industrial breeding thereof.

There was also discussion at the conference of such promising directions of plant protection as the use of biologically active substances(pheromones, repellents, hormones, "antifidants" [?] and others). as well as high-frequency current, and others. Experience has already been acquired with the use of pheromones for detection of sites of quarantinable objects (oriental peach moth). Sex pheromones of the codling, plum fruit and oriental peach moths, European grape moth, four species of garden moths, cornborer, silver Y moth, gipsy moth, click beetle, common vaporer moth, cabbage moth, bollworm, turnip moth, American white butterfly, and others, have been synthesized. The technology has been developed for use of pheromones of Laspeyresia moths, and European grape moth, for surveillance of the quantity and signaling of time of appearance of the pests.

Good results were obtained with the use of pheromones to control pests by disorienting males, creating a male vacuum for sterilization of specimens in the natural population.

Introduction of promising species that are now missing is one of the resources for increasing the species-related diversity of useful organisms in agrobiocenoses. The participants at the conference observed that more attention should be given to this question.

For the time being, there is limited use of the biomethod for the control of weeds and parasitic plants. It is being used with the greatest success against broomrape by means of the Phytomis leaf miners (on 200,000 ha). In Central Asia, the Phytomis lowers development of broomrape to economically imperceptible levels within 3-4 years in vegetable-cucurbit fields and 4-5 years in tobacco plantations. A study is in progress of the possibility of using the root-knot eelworm [Heteroderm radicicola] against pink gentian. A search is in progress for effective phytophages of ambrosia and dodder.

A serious study must be started as well of phytophage reproduction and acclimatization.

What then are the prospects of using the biological method: It is planned to broaden the scope of its use to 23 million ha in the immediate future, with entomophages involved on up to 14.7 million ha and microbiological agents on 8.3 million ha. Biological laboratories will be enlarged; obsolete equipment will be

replaced; there will be broader output of mechanized lines for breeding useful entomophages. The biomethod will take an important place in integrated systems for the protection of plants. This will make it possible to reduce significantly the use of chemical agents, which will have a beneficial effect on the environment.

Several suggestions and critical comments were made at the conference. In particular, it was stressed that there is inadequate methodological guidance of introduction of the biomethod; there are no recommendations on the placement and specialization of industrial biological laboratories. Some valid claims were made against the Agropribor Scientific-Production Association, which produces equipment that does not meet current technological specifications and does not assure complete mechanization of all processes. This association has not always been prompt to correct problems with delivered equipment, and installation thereof is slow.

There is an acute problem of training and assigning qualified personnel to the biological laboratories.

In several republics, hundreds of tons of biological agents remain for several years in warehouses without being moved; they lose their activity and deteriorate. This is very costly to the government. Scientific institutions are not conducting adequate research on new microbiological agents, refinement of those already in use, detection of promising local forms and types of parasites and predators, effective methods of using them. Many of the production workers' problems have to be solved by them independently, without the assistance of scientific research institutions. There is still inadequate coordination of scientific work on the biomethod, which causes duplication of studies, dispersion of resources, work on projects of minor importance, etc.

The participants at this All-Union conference adopted a special decision. It notes that there has been an increase in recent years in scope of use of the biological method in the RSFSR, Uzbekistan, Moldavia, the Ukraine and republics of Transcaucasia. However, continued development of the biomethod is being delayed because of some flaws and incompleted studies.

The conference recommended that there be a significant increase in use of biological agents under the 11th Five-Year Plan, that measures be instituted to improve the quality of the microbiological agents produced, that delivery thereof be increased and the assortment enlarged. It was decided to ask the concerned organizations to specialize the Odessa Branch of the Agropribor Scientific-Production Association for experimental and series production of equipment for mechanization and automation of production processes and use of biological agents. Production of agents based on biologically active substances must be set up. The system of State testing of biological agents must be put in order. There must be more intensive supervision of implementation of recommendations dealing with demonstration, breeding and use of biological agents, paying special attention to the quality of biological products. The rayon level of the service should be reinforced with specialists in the biomethod. Research must be expanded in the area of developing natural resources of entomophages and entopathogens, paying special attention to development of criteria of efficacy of entomophages, methods of protecting them, keeping records of them and forecasting.

It was decided to ask the VASKhNIL to issue recommendations in the very near future concerning criteria of harmfulness of the main pests and level of efficacy of their natural enemies, and to sum up the knowhow gained by the leading biolaboratories. The recommendation was offered to the USSR Ministry of Health to expand research and provide prompt sanitary and hygienic evaluation of biological agents, as well as the technology for their production and use. The question was raised of introducing specialization in the biomethod to agricultural Vuzes.

The participants at this All-Union forum expressed their deep appreciation to Party, soviet and agricultural agencies of Azerbaijan for their good preparation and management of this conference, and requested that mention be made of the large amount of organizational work done by AzNIIZR and AzSKhI [Azerbaijan Agricultural Institute] to provide the necessary conditions for fruitful work of the conference.

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CSO: 1840/527

IN THE PRESIDIUM OF THE ALL-UNION ACADEMY OF AGRICULTURAL SCIENCES IMENI LENIN

Moscow VESTNIK SEL'SKOKHOZYAYSTVENNOY NAUKI in Russian No 3, Mar 81 pp 132-133

[Article]

[Text] The presidum of VASKhNIL [All-Union Academy of Agricultural Sciences imeni Lenin] discussed the question of diverting part of the discharge of northern rivers in the basin of the Volga River, and participation of scientific organizations under the VASKhNIL in this important task for the national economy. B. G. SHTEPA, USSR deputy minister of land reclamation and water resources, delivered a report. The following participated in a discussion of this problem: P. P. VAVILOV, academician of VASKhNIL, president of VASKhNIL; V. V. YEGOROV, L. G. BALAYEV, V. N. VINOGRADOV, Yu. N. FADEYEV, B. B. SHUMAKOV and I. S. SHATILOV, academicians of VASKhNIL; G. V. VOROPAYEV, corresponding member of the USSR Academy of Sciences; N. I. DRUZHININ, corresponding member of the VASKhNIL; A. V. UGRYUMOV, director general of the Raduga [rainbow] VNPO [All-Union Scientific-Production Association] and G. F. KOROMYSLOV (VIEV [All-Union Institute of Experimental Veterinary Science]).

Having heard and discussed the report of B. G. Shtepa, USSR deputy minister of land reclamation and water resources, the presidium of VASKhNIL approved the information of the USSR Ministry of Land Reclamation and Water Resources concerning the results of draft studies for diverting part of the discharge of northern rivers into the basin of the Volga River, direction and scope of the first section of the project and proposed development thereof in the basins of the Caspian and Azov seas. It was noted that the development of the national economy and increased use of water in the basins of southern rivers in the European part of our country advances territorial redistribution of drainage to the ranks of first and foremost national economic problems for the immediate future. The largest amount of fresh water used irretrievably is referable to irrigated farming, which is developing quite intensively. The need to stabilize the [illegible] the Caspian Sea and salinity of the Azov sea also makes it necessary to supplement them with fresh water.

In view of the fact that diversion of part of the discharge of northern rivers has as its main goal to supply water for development of agriculture over a vast region in the southeast European part of our country and reclamation work dealing with diversion is related to many ecological changes in the regions of diversion, transportation and use of run-off, it is imperative to conduct broad scientific research to validate all measures and prepare a forecast of the possible changes in the environment. It was also noted that predominant development of irrigation in northern Caucausus is considered the most expedient.

It was recommended that scientists and specialists concentrate on the following tasks in the course of their scientific research work in sectorial and regional departments of VASKhNIL under the 11th Five-Year Plan:

Study the possible effects of territorial redistribution of discharge on the ecological situation in the regions of diversion, transportation and use of diverted run-off from northern rivers, paying special attention to possible local changes referable to agricultural and forestry projects.

Acceleration of breeding of spring wheat, soybeans and feed crops for irrigation zones in order to obtain highly productive cultivars with short vegetation period, and with economical outlay of water to produce the harvest.

Development of irrigation schedules for the main agricultural crops with due consideration of economical use of irrigation water during the period preceding delivery of part of the discharge of northern rivers.

Study of methods of irrigation, cultivation and fertilization of chernozem soil that would preserve its fertility.

The Soil Institute imeni V. V. Dokuchayev was asked to conduct research under the 11th Five-Year Plan in order to prepare forecasts of changes in reclaimed land in the European part of our country as related to diversion of part of the discharge of northern rivers into the Volga River basin. It is also planned to have the All-Union Scientific Research Institute of Irrigated Agriculture, All-Russian Scientific Research Institute of Agricultural Use of Reclaimed Land, All-Union Scientific Research Institute of the Grain Industry, Ural Scientific Research Institute of Agriculture, Siberian Scientific Research Institute of Animal Feed, as well as agricultural VUZ's, participate in solving the problem.

* * *

The presidium of the VASKhNIL approved of the practice of raising corn for silage with ears having milk-ripe [yellow-ripe] kernels with the technology used at the Zavety Lenina, Krasnaya Zarya sovkhozes and other farms in Stupinskiy Rayon of Moscow Oblast. It was recommended that this practice be extended to farms in the Nonchernozem Belt of the RSFSR and northern regions of the Central Chernozem Belt.

By adhering to the set of agrotechnical procedures, proper choice of permanent plots, choice of appropriate early ripening hybrids, optimum use of organic and mineral fertilizers, and regularly treating soil with lime, preparing seeds appropriately and effectively controlling weeds in the Nonchernozem Zone, one can obtain a stable harvest of green corn mass with milk-ripe kernels of 400-450 q/ha, which would increase drastically in this zone the production of high-grade silage, which is the main succulent feed in the diet of cattle.

The recommendation was made to scientific research institutions, their experimental farms and the training farms of VUZ's, agricultural agencies, managers and specialists of kolkhozes and sovkhozes in the Nonchernozem Zone of RSFSR and northern parts of the Central Chernozem Region, with reference to adopting this technology for raising corn for silage with milk-ripe kernels, to pay special attention to

meticulous selection of permanent plots with good drainage and aeration and, if possible, southern exposure, which would increase the sum of active temperatures by 80-100°C, as well as to make estimates of mineral fertilizers to be used for a planned harvest by the balance method with consideration of natural soil fertility. Use of phosphorus and potassium fertilizers is recommended in the main cultivation of soil and nitrogen fertilizers before sowing and in the form of supplements; organic fertilizers should be applied at least once every 3-5 years in large doses (80-100 tons/ha); on acid soil, there must be regular liming, bringing the pH to 5.5-6.5; highly productive early ripening corn hybrids should be selected, which are guaranteed to ripen to the milk-ripe stage; there must be thorough preparation of seeds using the hydrophobization method; it is mandatory to adhere strictly to the optimum depth of seed sowing (3-5 cm) in the moist layer of soil, which permits maximum utilization of heat resources of the early spring period and accelerates substantially appearance of shoots, providing for optimum density of plants (in the Nonchernozem Zone it should constitute 100,000-120,000 plants/ha at harvesting time); it is mandatory to use the highly effective herbicides, simazin or atrazine: 5-6 kg/ha of active constituent the first year of development of a plot, 2.5-3 kg/ha in subsequent years. Product 2,4-D should be used if the fields are glutted with annual dicotyledonous or perennial weeds; corn should be harvested at the stage of optimum ripeness for silage, within a short period of time, making use of harvesting and transportation complexes.

A system of measures has been developed to introduce advanced scientific-production knowhow on raising corn from hydrophobized [water-repellent] seeds.

* * *

The Certificate of Honor of VASKhNIL was awarded to the following:

Prof V. V. MILOSERDOV, doctor of economic sciences, director of the Scientific Research Institute of Economics and Management [Organization] of Agriculture for the Nonchernozem Zone of RSFSR, for his many years of conscientious work in agriculture, and in connection with his 50th birthday.

M. K. KHOKHRYAKOV, doctor of biological sciences, professor at the All-Union Scientific Research Institute for Protection of Plants, for many years of fruitful work in the area of methodological guidance of research and personnel training in the Laboratory of Mycology.

V. A. BOZHOK (scientific secretary), O. S. ZHUKOV (deputy director), A. A. ZUBOV, V. A. IVANOV, L. A. ISHCHENKO, O. P. KATSURA, G. A. KURSAKOV (director), Ye. A. LESYUK, B. L. NIKITIN, K. V. STANKEVICH, I. M. FILIPPENKO, Ye. N. KHARITONOVA and S. P. YAKOVLEV, on the staff of the Central Genetic Laboratory imeni I. V. Michurin, for their many years of work, major contribution to development of agricultural science and in connection with the 125th anniversary of the birthday of I. V. Michurin.

V. M. VOLOKHOV, E. I. GUDAKOVA, V. M. ZUBOV, G. F. KOSOV, V. S. OVODOV, P. M. STEPANOV (head of the institute), N. S. TIMCHENKO, G. A. SHTOKOLOV and K. P. SHUMAKOVA, a team at the Novocherkassk Engineering and Land Reclamation Institute, for their many years of fruitful work in the area of training scientific personnel and in connection with the 50th anniversary of the founding of this institute.

I. I. PUGACHEV, director of the Central Asian Branch of the All-Union Scientific Research Institute of Plant Growing imeni N. I. Vavilov, for his great achievements in organizing the study of plant resources at this institute and in connection with his 50th birthday.

V. M. BAUTIN (CC Komsomol), V. V. KASTORNOVA (All-Union Scientific Research Institute of Economics) I. I. LOTOTSKIY (Kamenets-Podol'sk Agricultural Institute), V. V. MAL'TSEVA (Stavropol' Scientific Research Institute of Agriculture) and P. V. KHRAMTSOV (All-Union Scientific Research Institute of Economics, Technology and Management of Agriculture [VNIETUSKh]), for achievements in scientific research, considerable public service and active participation in the All-Union School for Young Scientists and Specialists in Agriculture to increase labor productivity and refine management of agriculture.

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CSO: 1850/531

UDC: 061.3+616.988

PRESSING PROBLEMS OF VETERINARY VIROLOGY

Moscow VESTNIK SEL'SKOKHOZYAYSTVENNOY NAUKI in Russian No 3, Mar 81 pp 149-150

[Article* by O. I. Sukharev, candidate of veterinary sciences, and M. N. Sokolov, candidate of veterinary sciences]

[Text] More than 200 people participated in this conference, which was organized by the USSR Ministry of Agriculture, VASKhNIL [All-Union Academy of Agricultural Sciences imeni Lenin] and Kazan' Veterinary Institute imeni N. E. Bauman. The plenary session was opened by P. P. RAKHMANIN, deputy head of the Main Administration for Veterinary Science of the USSR Ministry of Agriculture. B. M. ISAYEV, deputy chairman of the Council of Ministers of Tatarskaya ASSR, delivered the salutatory address to the participants at the conference; he spoke about the major socioeconomic transformations that occurred in that republic in the years of Soviet rule, noting the significant advances in development of agriculture in Tatariya.

P. P. RAKHMANIN (Main Administration for Veterinary Science, USSR Ministry of Agriculture) delivered a paper dealing with the main tasks for the veterinary service for the control of viral diseases of animals. He stressed that virological veterinary science has made significant strides in the study of diagnostics and prevention of some infections of viral etiology, and he dwelled on the tasks that face this discipline with regard to control of viral diseases of animals.

Prof I. A. BAKULOV (All-Union Scientific Research Institute of Veterinary Virology and Microbiology) delivered a paper on the scientific bases of forecasting occurrence and distribution of viral diseases of animals, stating that scientific forecasting is an inseparable element of the overall chain of epizootic-control measures. Use of scientifically substantiated principles and methods of forecasting, followed by preparation of long-term forecasts for a number of diseases of viral etiology, makes it possible to institute promptly the necessary epizootic-control measures at lower economic cost and on a more sophisticated scientific-methodological level.

The speech of V. N. SYURIN, corresponding member of VASKhNIL, dealt with little-studied viral infections and plans for studying them. The speaker stated that virological science has made some strides in the study of respiratory viral diseases of cattle, in particularly, infectious rhinotracheitis (IRT), parainfluenza-3 (PI-3), viral diarrhea (VD-BS), adeno- and respiratory-syncytial infections. Details were furnished on many issues related to the study of pathogenesis, immunogenesis, diagnostics and development of specific preventive agents. The intimate

*Fifth All-Union Veterinary Virological Conference, Kazan', 1-3 October 1980.

aspects of interaction between virus and cell on the level of the macroorganism were established. It was shown that there may be a vertical route of transmission and intrauterine fetal infection with IRT, VD-BS, prolonged persistence of IRT virus antigen in neurons of the trigeminal ganglion, development of immunological tolerance followed by inability to withstand the pathogen. More recently, there have been intensive studies of pathogens that induce diseases of neonate calves. This refers to the pathogens of mouth ["rota"--Rothia?] and coronavirus infections, which cause gastrointestinal tract disorders in neonate animals.

N. N. KRYUKOV, candidate of veterinary sciences (All-Union Institute of Experimental Veterinary Science) described the principles of specific prevention of pneumoenteritis in cattle; he reported in detail about current agents for specific prevention of respiratory viral infections of cattle, including seroprophylactic agents. It was shown that immunity can be obtained by using live and inactivated vaccines in various combinations, as well as specific sera or gamma globulins. The choice of a given preventive agent depends on the existing epizootic situation. The vaccine against infectious rhinotracheitis of cattle, which is used extensively in veterinary practice, permits drastic reduction of morbidity and deaths.

A. I. SOBKO, doctor of veterinary sciences (Ukrainian Scientific Research Institute of Veterinary Science) discussed the problem of viral gastroenteritis of swine, commenting on the urgency of the problem of preserving young stock at large swine breeding farms and industrial complexes. The main objective of his study was to develop the means of diagnosis and specific prevention of viral (transmissive) gastroenteritis of swine.

Modern methods of diagnosing viral diseases of animals was the topic of the paper of R. Kh. YUSUPOV (Kazan' Veterinary Institute). He described the current status of diagnostic work with reference to viral infections of farm animals, calling attention to high-speed diagnostic methods, as well as promising serological methods. The indirect hemagglutination reaction in different modifications has been introduced on a broad scale into the practice of scientific research institutes and laboratories; this also applies to immuno-enzyme methods that provide for a high degree of demonstration of viral antigen in tested material and permit detection of antibodies in animals' blood serum.

A. Z. RAVILOV, doctor of veterinary science (Kazan' Veterinary Institute) reported on the results and prospects of studying Chlamydia infections of livestock. Data are submitted on isolation of strains of Chlamydia in cases of miscarriage among sheep and goats; a set of antigens and sera was developed from the pathogen in bovine abortus for serological diagnosis of Chlamydia infections in livestock, which had greater antigenicity and specificity than ornithosis antigen.

Subsequent work of this conference proceeded in six sections. In the section on epizootiology of viral infections more than 20 speeches and papers were delivered. The main reports dealt with epizootiological bases of viral pneumoenteritis of cattle, viral (transmissive) gastroenteritis of swine and Chlamydia infection of livestock.

Prof I. A. BAKULOV (All-Union Scientific Research Institute of Veterinary Virology and Microbiology) spoke about the distinctions of occurrence of viral diseases of animals under modern conditions and forecasting thereof. He described the current status of viral diseases of farm animals.

The paper of V. I. POPOV (All-Union Scientific Research Institute of Veterinary Virology and Microbiology) submitted data on immunization of neonate piglets with virus vaccine against Aujeszky's disease. It was demonstrated that piglets immunized once with oral vaccine before intake of colostrum become insusceptible to infection with this pathogen within 24-48 h. The efficacy of this method of inoculating neonate animals depends on the time and dosage of immunization, activity of viral vaccine, primary effect of antigens of the vaccine strain of virus on immunocompetent systems of the organism.

Section of diagnostics of viral infections: The main topics were: refinement of methods of preparing antigens for serological reactions (studies of activity, specificity); possible use of erythrocyte antigen in the case of Aujeszky's disease and IRT; allergic diagnostics of some viral infections (Aujeszky's disease and IRT); use of electron microscopy for detection of pathogens of Aujeszky's disease, influenza and diarrhea of calves.

Section of biochemistry, molecular biology, genetics, morphology and culture of viruses: A total of 15 papers and 7 scheduled speeches were delivered in this section, dealing with different problems of molecular biology of viruses. There were several papers on stability of genetic properties of some viral strains used to prepare vaccines.

Section of "immunization methods": There were many speeches dealing with the study of associated vaccines for animals against viral infections differing in serological relationship, as well as the results of using a combined single vaccine against some bacterial infections. V. I. STETSENKO (Ukrainian Scientific Research Institute of Experimental Veterinary Science) reported on the results of using trivalent viral vaccine against mixed viral infections in industrial complexes that fatten up cattle. The possibility of using polyspecific serum for acute resporatory diseases of cattle was the topic of N. M. KONNOV (Kazan' Veterinary Institute) and V. I. KIS (Moscow Veterinary Academy).

Section of "vaccines, bio-industrial production of antiviral preparations": Reports presented in this section dealt with assessment of immunogenicity of antiviral vaccines, study of activity of viral vaccination against Aujeszky's disease, homologous and heterologous prophylaxis of viral diarrhea of cattle and development of polyspecific sera against Chlamydia, mycoplasma of cattle and other diseases.

Section of "pathogenesis and pathomorphology of viral infections": More than 20 papers and scheduled speeches were delivered. There were interesting reports on morphogenesis with the use of antiviral vaccines, experimental viral infections of cattle, effects of immunosuppressants on defense factors of the organism in the presence of these infections (B. V. GORSKIY--Kazan' Veterinary Institute); about the reactions of T and B lymphocytes and production of secretory antibodies in neonate piglets immunized by mouth (V. I. POPOV, All-Union Scientific Research Institute of Veterinary Virology and Microbiology); ultrastructural changes in cells of the ciliate epithelium of airways in the presence of mycoplasmosis and Chalmydia infection in calves (P. M. MITROFANOV--Institute of Experimental Veterinary Science of Siberia and the Far East), and others.

The conference adopted a decision, which notes that veterinary virological science has made great advances in the diagnosis and prevention of particularly dangerous infections. It is imperative to resolve a number of organization and educational-methodological problems, which the participants discussed in detail, for this science to continue its successful development.

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CSO: 1840/531

UDC: 63+525.23

BOOK ON ADVANCES AND PROSPECTS OF PROBING DEEP INTO THE EARTH IS REVIEWED

Moscow VESTNIK SEL'SKOKHOZYAYSTVENNOY NAUKI in Russian No 3, Mar 81 pp 151-152

[Review by V. V. Kovalenok, pilot-cosmonaut of the USSR and hero of the Soviet Union, and L. G. Gruzdev, candidate of biological sciences, laboratory head at VNIPTIK, of book "Aerokosmicheskiye metody izucheniya pochv" [Aerospace Methods of Studying Soil], by V. L. Andronikov, Moscow, 1979]

[Text] For the last few decades there has been intensive development of research related to space physical geography. At the present time, various materials brought back by manned spacecraft, orbital stations, automatic artificial satellites, as well as high-altitude aircraft, play a substantial role in the study of land and agricultural resources. Many tasks referable to keeping records and studying soil and vegetation resources, charting maps and analytical reports for ongoing control of agricultural production and many others are made simpler because of the information obtained from processing such materials.

The book being reviewed deals with a number of aspects of using aerospace technology and methods of deep probing in soil science, and it submits the results of the author's many years of research on the use of various methods for deep probing of agricultural sites, and analyzes Soviet and foreign knowhow in this field.

In the first chapter, the author tells about the history of development of aerospace methods of studying soil, inception of aviation methods (1927-1950), use thereof in soil mapping work in various natural zones of our country and abroad; he describes the current status of aerospace methods that are used in soil science and agriculture, including multizone and multispectrum photography.

The second chapter deals with the types of aerial photography and space photography of the earth's surface, equipment for space photography and instruments for interpreting the photos. In concise, but detailed enough form, the author describes the main methods for remote examination of the soil surface [mantle], types of aerial photographic equipment, space equipment, main stages of refinement of methods and equipment for probing soil and plant resources, possibility of identifying different types of soil on aerial and space photos, spectral zones of effective photosensitivity of color and spectrozonal film and certain other questions.

The third chapter of the book deals with theoretical bases of interpretation as it applies to the task of studying our planet's soil mantle. As noted by the author, three methods have been used in recent years to decode photos: visual,

visual-instrumentation and automatic; the latter, in turn, involves transformation of the photographic image of the soil cover into digital form and statistical processing of filtered images on a computer. Among the most important directions of digital automated processing of images, the most important are those related to formalization of video information, automation of interpretation with the use of computer complexes and development of appropriate mathematical models. In a relatively short chapter, the author acquaints the reader with theory of soil identification, considering as the main tasks the detection and outline of territories with similar structure of the soil cover, genetic soil identification, extrapolation parameters for interpretation. He discusses problems of evaluating the spectral reflecting capacity of soil, possibility of identifying types of soil from the tint, color and texture of photos, the role of topography, elements of hydrography, size and shape of soil outlines, as well as vegetation and traces of agricultural activities of man in identification of soil.

The dynamics of changes in photographs of soil and agricultural land in different years and seasons are discussed in the fourth chapter, which is entitled "The Influence of Changes in Natural Conditions on Aerial and Space Photographs." As shown by the studies of the author, for agricultural purposes it is desirable to take pictures at least 4-6 times a year, depending on the objectives. It is best to take aerial photos for the study of the soil mantle in the spring, when the land is essentially free of plantings. Space photos taken in different seasons supplement one another with regard to fuller transmission of information about soil and agricultural resources of the natural regions under study, as well as for interpretation and description of dynamic processes there.

The fifth chapter tells about soil studies on the basis of space photos. At the present time, specialists in the field of using space photos for agricultural purposes believe that almost 90% of the information needed for optimum land use can be obtained entirely by means of long-distance methods. There is discussion of the use of space photos for keeping records of agricultural resources, soil mapping, estimation of agricultural crop harvests and improvement of land use. The scope of space photos, methods of identifying types of soil according to different features and monitoring its condition are discussed. The fundamentals of agricultural decoding of space photos are concisely described.

The sixth and seventh chapters deal with the distinctions of identification of soil and plantings on multizonal aerial and space photos. There is a description of interpretation of multizonal photos according to spectral, textural and landform elements, as well as some examples and main parameters of interpretation for the steppe, arid steppe and desert zones of our country. Data are submitted on processing and interpretation of photos from the Meteor satellites, Soyuz-12 and Soyuz-22 spacecraft, the Salyut-4 orbital station and some others. Here too, vast experimental material is summarized on multizonal methods of studying the soil mantle, which was obtained by foreign researchers.

The eighth chapter of this monograph contains data on infrared photography, radiothermal and radar probing of soil. These methods are considered by the author to be ancillary to photography. At the same time, while they are still at the stage of experimental development, they offer the opportunity to obtain extensive and accurate information about the condition of agricultural crops. Thus, with the high sensitivity of detectors, radiometers can fix insignificant differences in temperature of the vegetation mantle, which is no doubt very important to

development of methods for early detection of plant diseases. Ultrahigh-frequency radiometric equipment makes it possible to take readings of the humidity of the earth's surface from space and high-altitude aircraft, while high resolution radar systems can be well-used to study soil moisture content, distribution of natural vegetation and plantings, to plan a number of agronomic measures. Radar photos of the earth's surface do not depend on presence or absence of fog and clouds, which makes this method of long-distance probing very important to the northern parts of our country. The author validly stresses the fact that effective investigation of soil and agricultural resources of earth is possible when such work is done in a complex manner, using photographic and photoelectronic methods.

The author discusses the use of the results of aerospace methods of probing for the study of soil resources, soil mapping, development of new types of soil maps, studies of dynamic properties of soil, records of utilization of land, agricultural-soil zoning in the ninth chapter and conclusion. He deals with the main scientific methodological problems, promising aerospace methods that should be further developed in soil science and agriculture.

Like any major work, the monograph of V. A. Andronikov is not without some flaws. Thus, it mentions very briefly the methods for automated processing of aerospace data with the use of computers and special machine complexes. He did not systematize methods for ground-based confirmation of the results of long-distance probing, as well as gathering photographic and visual information referable to different altitudes that is needed to refine the identifying tags on aerospace photos. The monograph has few color illustrations. We hope that our wishes will be taken into consideration when the book is re-edited.

There was a small printing of this book, and it rapidly disappeared from the book stores, which is quite understandable, in view of the increased interest in the problem it discusses of development of agricultural science and production. The readers have been given an interesting and needed book, written in a good literary language, which was intended for a wide circle of specialists in the engineering, biological and agricultural branches of science, as well as students and graduate students in the relevant disciplines.

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